MODEL AIRPLANE NEWS

FEBRUARY 1943
TWENTY CENTS

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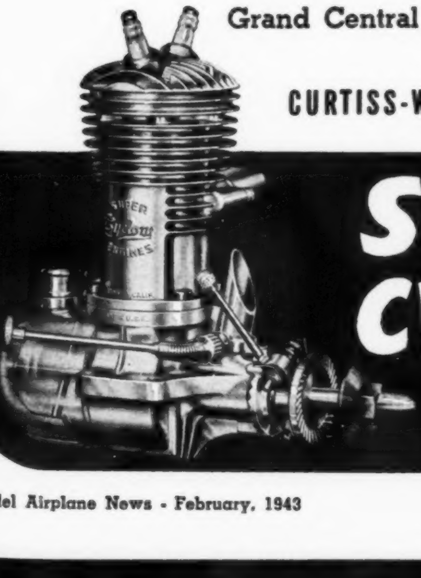
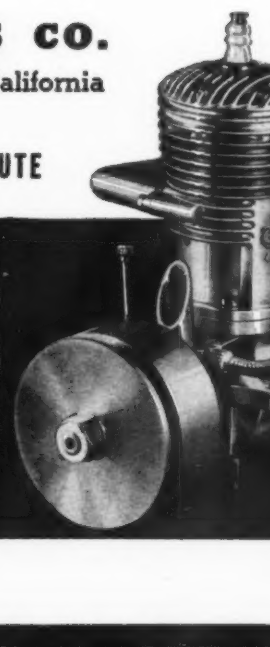


SUPER-CYCLONE



FLASH NEWS

ALMOST one year to the day after the Japanese attack on Pearl Harbor and our subsequent recognition of a state of war, American fighter pilots in American fighter planes have gone into action against the Nazi Luftwaffe in our prize fighting possession: the Lockheed P-38 twin-engine, high altitude interceptor. The type saw brief service in the Alaskan theatre attacking Jap-held installations on Kiska and Attu Islands but nothing worthy of note was proved by the enterprise. However, numbers of P-38s are now in action in Northern Africa and much worthy of note is the astounding success it has had in the opening rounds of the campaign, and will, undoubtedly, continue to have. In one particular encounter a total of 11 Messerschmitt fighters was destroyed in a little over 20 minutes of air fighting by a squadron of P-38s over Tunisia. We shall, undoubtedly, hear much more of these airplanes.

Although almost 1/2 the total number of commercial airliners of the nation are now wearing Army colors, the total airline scheduled mileage has dropped only 28 percent, it was recently reported by the Civil Aeronautics Board. Of a total 324 planes in domestic operation last May, there are now only 166 planes plying their courses: and these are virtually in military service due to governmental priority demands for members of the armed forces and of the government. Whereas each airplane was flying a total of only 1,138 miles per day last May, each airplane is now logging an average of 1,595 miles per day. No airline deliveries have been made for seven months, with little or no promise held for any more deliveries for the duration. The airlines have been negotiating for the Lockheed Constellation four-motor giant upon completion but it now appears that the Army will get this ship, too.

According to Major Thomas Hitchcock, of the Army Air Forces, the North American Mustang (MODEL AIRPLANE NEWS, September 1941 issue) will "be the plane to beat in 1943." The newest version is powered with a Packard-built Rolls-Royce Merlin Engine and Major Hitchcock's opinion is shared by British pilots of Coastal Command Cooperation Squadrons which have used the plane. "It is best described as a 'pilot's airplane'," says Hitchcock, who was the youngest member of the famed Lafayette Escadrille of World War I, "and it is very fast and handles beautifully at high speeds. Fliers feel that they have always known how to fly the plane after they have been in it only a few moments."

"A change of strategic planning" is the Navy's explanation of its cancellation of the huge projects for the Boeing Sea Ranger (MODEL AIRPLANE NEWS, October 1942 issue) and Vought-Sikorsky flyingboat projects, the latter a deal with Nash-Kelvinator for construction of an extensive number of the four-motor giants.

Vociferous Andrew Jackson Higgins, self-styled "largest boat builder in the world," has been awarded a contract to build 1,200 Curtiss C-76 cargo planes at a new New Orleans plant. Colonel John Jouett, formerly president of the Aeronautical Chamber of Commerce, has been appointed vice-president of the newly formed Higgins Aircraft, Inc. and will manage the entire program which, according to Higgins, promises delivery of the first airplane in six months. The C-76 is an all-wood-plastic version of the famed Curtiss C-46 Commando twin-engine transport.

In a recent address by Lieut. General Henry H. Arnold, it was stated that the Army Air Forces expect a total force of 2,500,000 officers and men by the end of 1943. This force will approximate one-th'rd the total armed forces of the nation anticipated by the end of this year.

TOTALS: During the month of October the Axis lost a total of 402 airplanes in Europe, the Middle East and Great Britain, compared to a total loss of only 242 planes suffered by the Allies. Of this latter total, seven were Boeing Flying Fortresses which accounted for 70 of the 88 planes shot down over Europe, while the defenders of beleagured Malta claimed 138 of a total of 202 Axis raiders downed in the Middle East.

A recent report states that Canada's aviation industry is now producing four-engine Lancaster bombers, deHaviland twin-engine Mosquito reconnaissance bombers, Curtiss dive-bombers and Consolidated PBY flyingboats.

Secretary of the Navy Frank Knox has revealed that the Navy is acquiring a number of Consolidated B-24 Liberator four-motor land-based bombers. This move comes as a result of the huge success had recently by the type, particularly those operating in the South Pacific theatre under General Douglas MacArthur. This change of tactical planning has also resulted in cancellation of two flyingboat projects.

The latest Congressional appropriation for aircraft goes to the Navy Department and calls for the expenditure of \$2,862,000,000 to purchase a total of 14,611 airplanes of various types including dive bombers, scouts, fighters, trainers and four-engine land-based bombers. This brings to a total of \$5,766,406,962 the appropriations for the construction of Naval airplanes in the amount of 27,500 of all types.

According to a news release, Consolidated B-24 Liberator bombers contain a total of 315,000 parts obtained from suppliers and sub-contractors in 28 states and the Province of Ontario in Canada. There

(Continued on page 61)

14TH YEAR OF PUBLICATION

MODEL AIRPLANE NEWS

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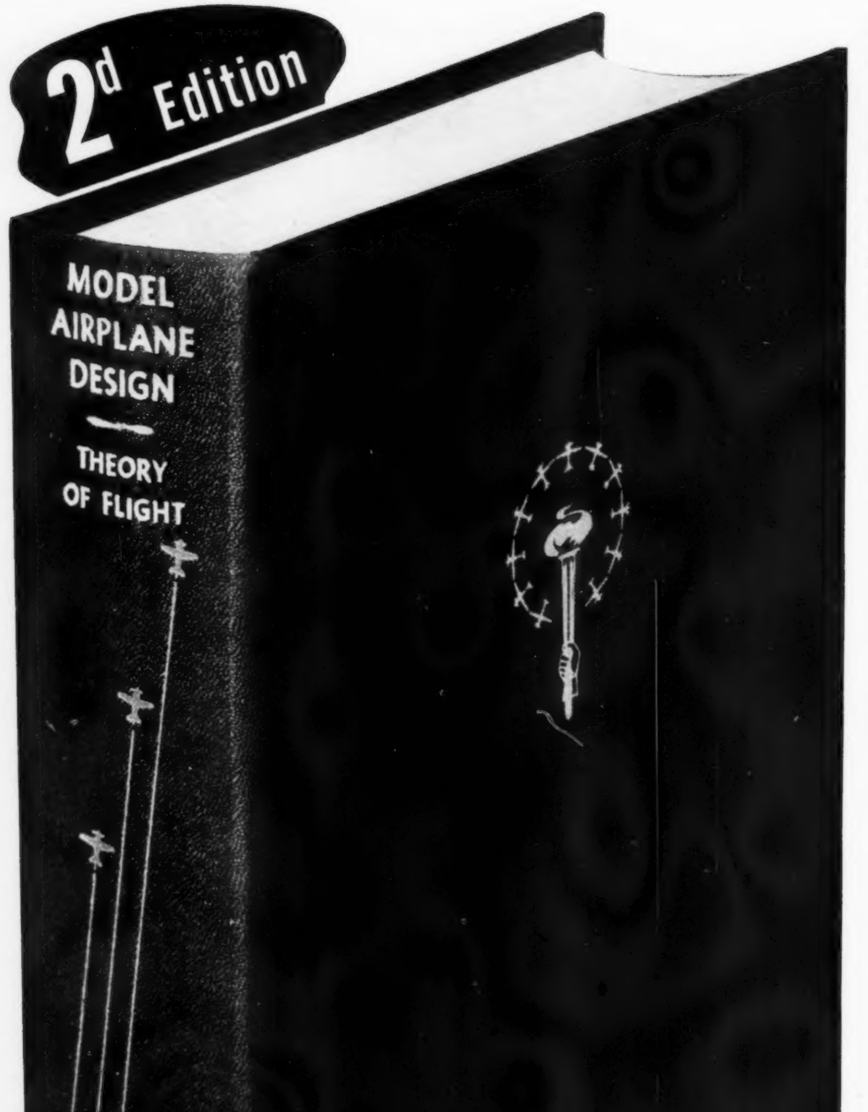

THE FIRST EDITION OF THIS widely acclaimed work was completely exhausted, and the second edition is now available! Read a few of the many letters from enthusiastic owners of this volume and you will understand why Mr. Grant's outstanding aviation handbook is in such great demand:

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"It's a splendid piece of work, the best ever written on model theory and construction . . . thoroughly sound and practical . . . and will be welcomed with joy by everyone interested in the art."—*Alexander Klemin, Daniel Guggenheim School of Aeronautics, N. Y. University.*

"I regard Mr. Grant as THE AUTHORITY."—*J. F. P.*

"It's about time a book of this kind was published as it gives the modeler a 'treasure-house' of practical instructions and information. I know it will help me immensely, as well as the other members of our club."—*F. B.*

"I intend using these books in my classes."—*K. T. S., Industrial Arts Instructor.*

"Your book is being used by our staff, and is very helpful."—*Aviation Education Research Project.*

528
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205
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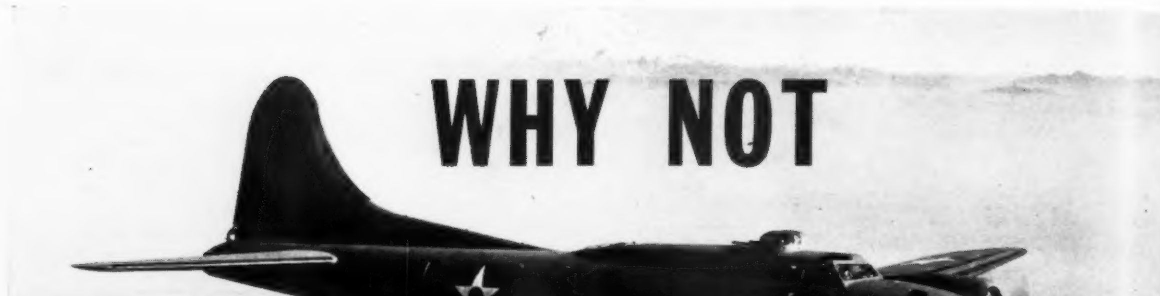
WHY NOT FOUR ENGINE FIGHTERS?



Here is the answer to what the hard-hitting long range fighter of the future should be

by KEITH AYLING

ONE of the outstanding lessons of three years of aerial warfare is that the modern conception of the fighter plane has many limitations.

The most deadly fighter plane in the air today is fettered to its home base by an invisible string: limited range. It rarely can operate outside a radius of 250 miles from its airfield and in heavy action it must descend for refuelling in something under forty-five minutes. During the Battle of Britain Hurricane and Spitfire pilots were limited to a practical radius of 80 miles.

To obtain speed and climb, the single seater plane designer has been forced to sacrifice load capacity; machines armed with eight to twelve machine guns of varying calibre, or a combination of shell-firing cannon, can only carry a small quantity of ammunition and fuel. An eight-gun Spitfire has a maximum of operational fire-power limited to sixteen seconds.

Combats between fighters of opposing nations reveal that these ships are highly vulnerable. Only superior pilot skill gives one a slight edge over the other. In a recent clash between British and German fighter planes in Libya, the British lost eleven, the Germans ten. During the Battle of Britain when British losses were comparatively low compared with the German, R.A.F. pilots had definite orders to take "evasive action" from German fighters and concentrate on the bombers.

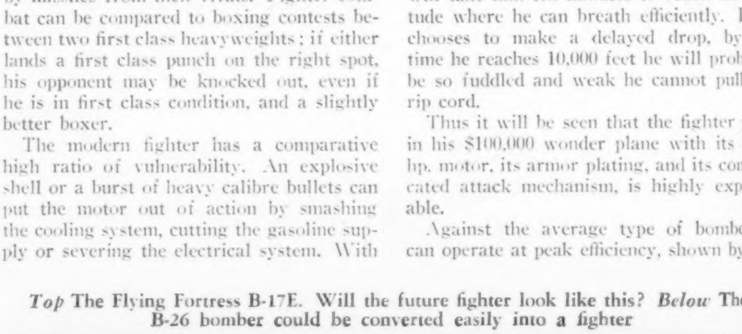
German and British conventional fighter design has progressed simultaneously step by step. Although the Typhoon and the Spitfire V may have a turn of speed over the FW 190 and the latest modification of the ME 109F, all can be put out of action by missiles from their rivals. Fighter combat can be compared to boxing contests between two first class heavyweights; if either lands a first class punch on the right spot, his opponent may be knocked out, even if he is in first class condition, and a slightly better boxer.

The modern fighter has a comparative high ratio of vulnerability. An explosive shell or a burst of heavy calibre bullets can put the motor out of action by smashing the cooling system, cutting the gasoline supply or severing the electrical system. With his engine out of commission the pilot must descend. Incendiary bullets may set fire to the gasoline tanks or the fuselage. Enclosed in his cockpit the pilot has no means of extinguishing such fire or he, himself, may be put out of action, either by a direct hit, or disabled oxygen apparatus. At 30,000 feet without oxygen he rapidly loses consciousness and even if he bails out there is little hope of survival. Should the parachute open a few seconds after jumping it will take him ten minutes to reach an altitude where he can breath efficiently. If he chooses to make a delayed drop, by the time he reaches 10,000 feet he will probably be so fuddled and weak he cannot pull the rip cord.

Thus it will be seen that the fighter pilot in his $100,000 wonder plane with its 2000 hp. motor, its armor plating, and its complicated attack mechanism, is highly expendable.

Against the average type of bomber it can operate at peak efficiency, shown by the

Top The Flying Fortress B-17E. Will the future fighter look like this? *Below* The B-26 bomber could be converted easily into a fighter



heavy German losses over Britain, and by the severe losses inflicted by the Germans on British bombers in daylight operations over Germany. On one occasion the R.A.F. lost 32 four engine bombers, a record high.

Fighters have two main functions in military operations: to intercept bombers and to protect their own bombers from enemy fighter attack.

In its second function the normal fighter plane is not adequate for its job if the bomber sortie exceeds 200 miles. In escorting bombers a fighter squadron covers 40% more distance than the bombers, proportionately reducing its range.

If the fighter plane is given increased range by additional gasoline it must sacrifice speed and maneuverability or firepower. The Japanese Zero is reported to have a range of 900 miles which has been increased to 1500 by addition of a belly tank which can be jettisoned when empty. The Zero, however, has little armor, the pilot flies without a parachute or such essential luxury as self-sealing tanks. He has two short range slow firing 20 mm. cannon, and two small machine guns. If a Zero is hit by a burst of 50 calibre machine gun bullets it disintegrates.

Many efforts have been made to increase fighter range. The British pressed into service the American A-20 light bomber as a daytime bomber escort and it acquitted itself well. For night interception, which falls for even longer periods in the air—and less speed—they adapted the A-20 (Havoc II), fitting extra gasoline tanks and increased armament.

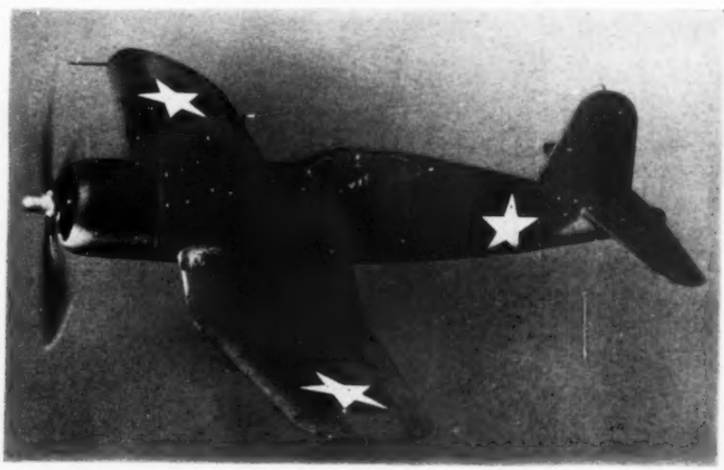
Another long range fighter is the twin-motor Bristol Beaufighter, a cousin of the Blenheim bomber fighter. The heavyweight Beau probably carries more armament than any other fighter in the air today: four shell cannon and a number of machine guns. Of its 20,000 odd pounds some 2000 pounds are devoted to armament and ammunition.

Another formidable fighter-bomber is the ME 110, the workhorse of the German Luftwaffe. The ME 110, powered by two 1,150 hp. Daimler Benz motors, has appeared in many forms against the British and as a two seater fighter with a range of well over one thousand miles it proved an efficient bomber escort. When it appeared as the Jaguar, a four seater bomber fighter with more than half a ton of bombs, it

(Continued on page 46)

The Fortress B-17E passes over. Guns fire from nose, tail, top and bottom

Above The British Hurricane with four 20 mm. cannon is vulnerable because of its single engine and pilot. *Below* The Vought Sikorsky F4U-1, one of the fastest shipboard fighters in the world



"Stingers" in the tail of the B-17E bomber (Fighter?)

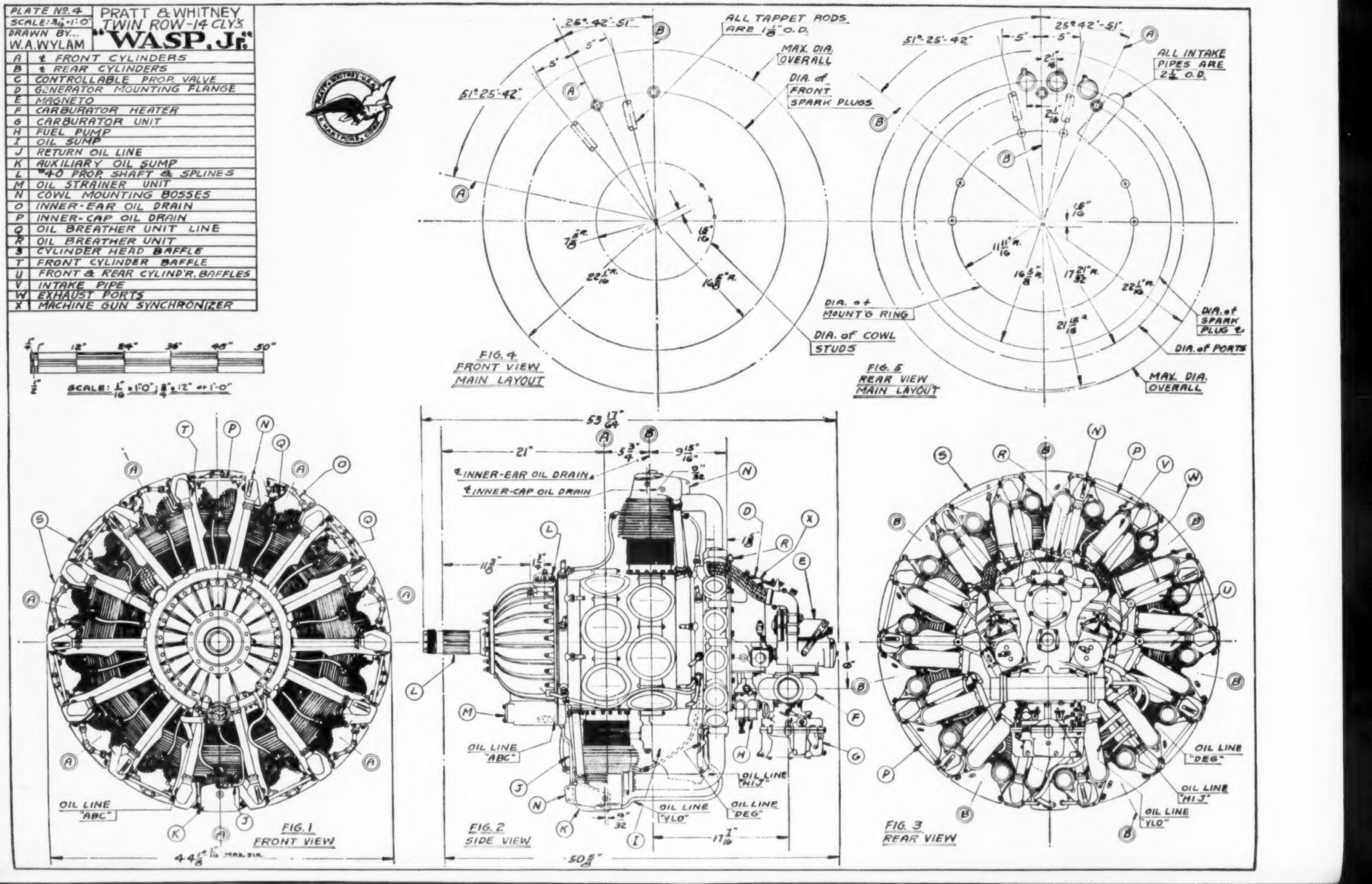
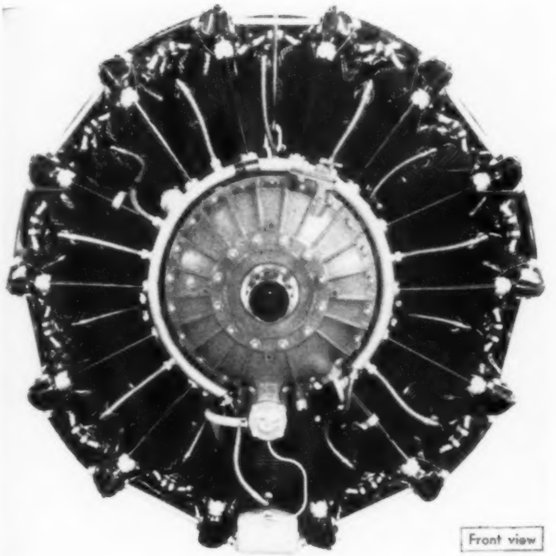
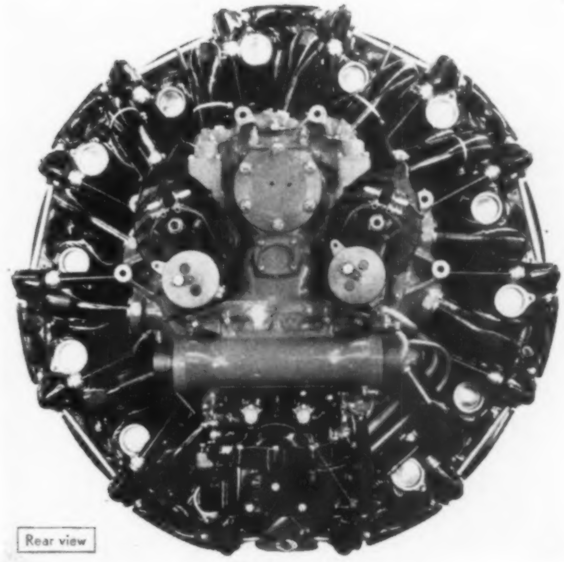


PLATE No. 4
SCALE: 3/16"=1'-0"
DRAWN BY... W.A.WYLAM
PRATT & WHITNEY TWIN ROW-14 CLY'S "WASP, Jr."
A ℄ FRONT CYLINDERS
B ℄ REAR CYLINDERS
C CONTROLLABLE PROP. VALVE
D GENERATOR MOUNTING FLANGE
E MAGNETO
F CARBURATOR HEATER
G CARBURATOR UNIT
H FUEL PUMP
I OIL SUMP
J RETURN OIL LINE
K AUXILIARY OIL SUMP
L #40 PROP. SHAFT & SPLINES
M OIL STRAINER UNIT
N COWL MOUNTING BOSSES
O INNER-EAR OIL DRAIN
P INNER-CAP OIL DRAIN
Q OIL BREATHER UNIT LINE
R OIL BREATHER UNIT
S CYLINDER HEAD BAFFLE
T FRONT CYLINDER BAFFLE
U FRONT & REAR CYLIND'R. BAFFLES
V INTAKE PIPE
W EXHAUST PORTS
X MACHINE GUN SYNCHRONIZER
SCALE: 1/16"=1'-0"; 3/4"=12" or 1'-0"
ALL TAPPET RODS ARE 1 1/8" O.D.
MAX. DIA. OVERALL
DIA. of FRONT SPARK PLUGS
DIA. of COWL STUDS
FIG. 4 FRONT VIEW MAIN LAYOUT
ALL INTAKE PIPES ARE 2 1/4" O.D.
DIA. of MOUNT'G RING
DIA. of SPARK PLUG ℄
DIA. of PORTS
MAX. DIA. OVERALL
FIG. 5 REAR VIEW MAIN LAYOUT
℄ INNER-EAR OIL DRAIN
℄ INNER-CAP OIL DRAIN
OIL LINE "ABC"
OIL LINE "HIJ"
OIL LINE "YLO"
OIL LINE "DEG"
FIG. 1 FRONT VIEW
FIG. 2 SIDE VIEW
FIG. 3 REAR VIEW



Front view



Rear view

MODEL THIS TWIN WASP JR.

Plans with complete instructions to build a model of a famous engine in exact detail

by WILLIAM WYLAM

THE Twin Wasp and the Twin Wasp Jr. are not new type engines as Pratt & Whitney engineers designed the basic engine of this type over ten years ago.

It was known then that the Aeronautical Industry's demand for more and more horsepower would overtax the capacity of their famous single row engines, the Wasp and Hornet, so the double or twin row engines were designed. Single row engines of the same horsepower ratings as the twin row, per weight, would have such a large frontal area that the advantages of more hp. would be lost by the excessive amount of hp. needed to push the front engine cowl through the air. The small frontal area of the twin row engine models also provides greater visibility for the pilot. The more frequent power impulses of the 14 cylinders provide smoother operation and longer life for the engine.

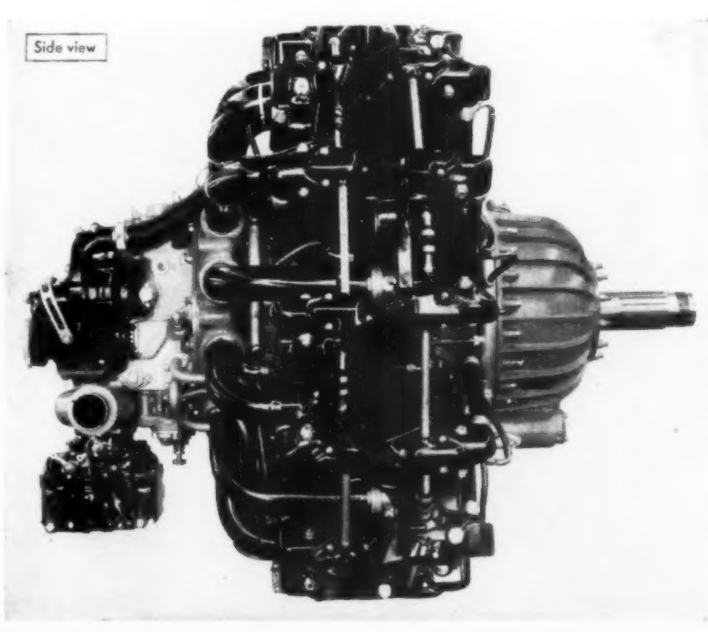
The ingenious features such as automatic valve lubrication, automatic mixture and power control, thermostatic oil system combined with other distinctive Pratt and Whitney features produced a high powered engine with no sacrifice in qualities and reliabilities created by the reputation of the Wasp and Hornet engines. This is why there are now over 5,000 engines already in commerical and military service since the first model was produced in 1933.

These plans on the twin row Wasp Jr. were drawn so the model builder can build an exact duplicate of the real engine. Plans have been and will be drawn on popular military and commercial airplanes that use this type engine and will be published in super-sets by MODEL AIRPLANE NEWS only.

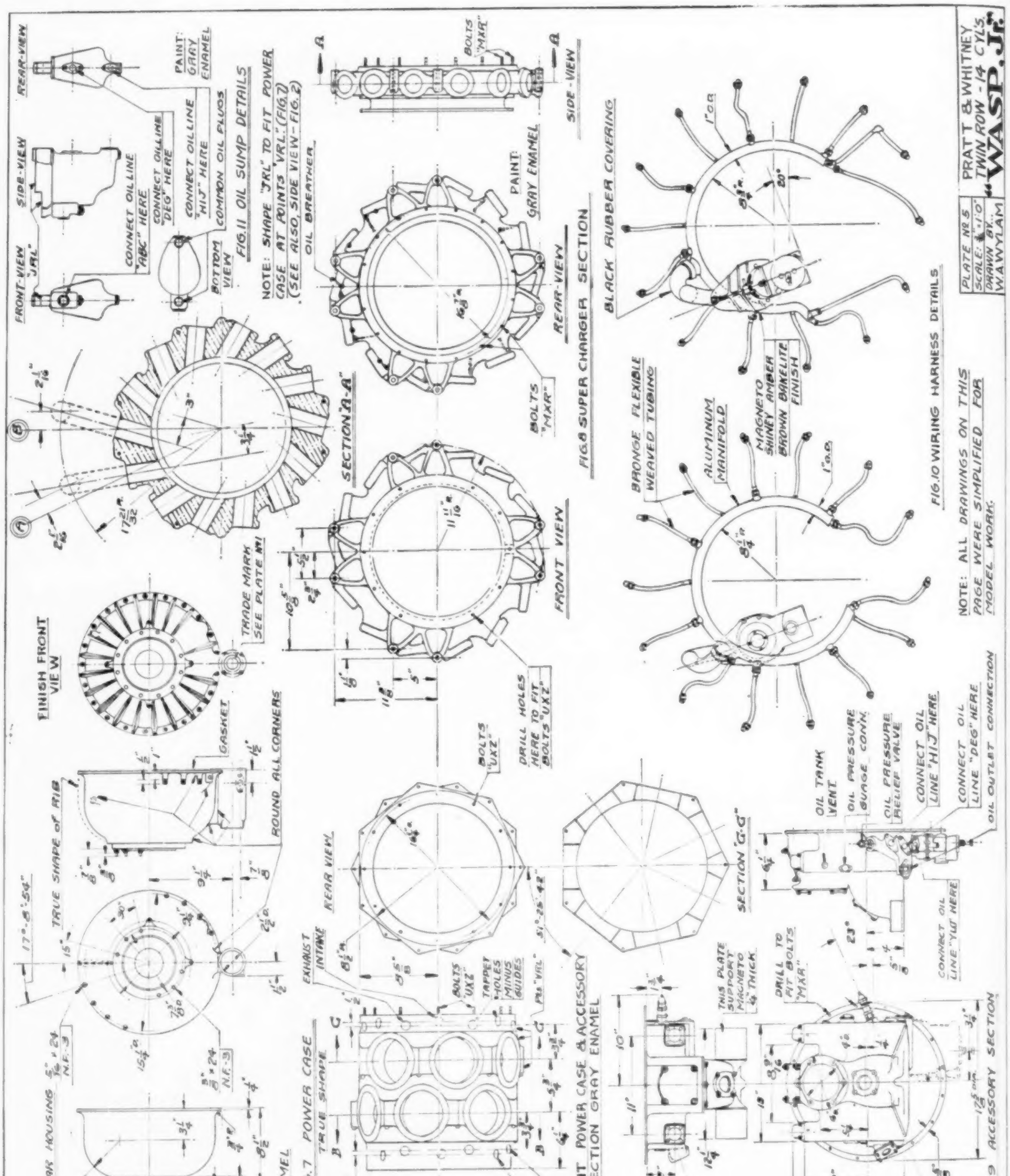
Modelers of this era are now getting out of the "hunk of wood model" class and are building great realism into their models, as shown by the rapid strides made in gas models and the recently built scale models. If the builder prefers, he can make just a dummy motor for a desk piece; or a dummy motor that looks almost real inside an engine cowl but still not build the entire motor as shown in the assembly drawing on Plate No. 1. He also can build the entire engine and mount it on the airplane model just like the mount for real motors. But before we start to build the motor, let us learn something about the mechanism of the real motor.

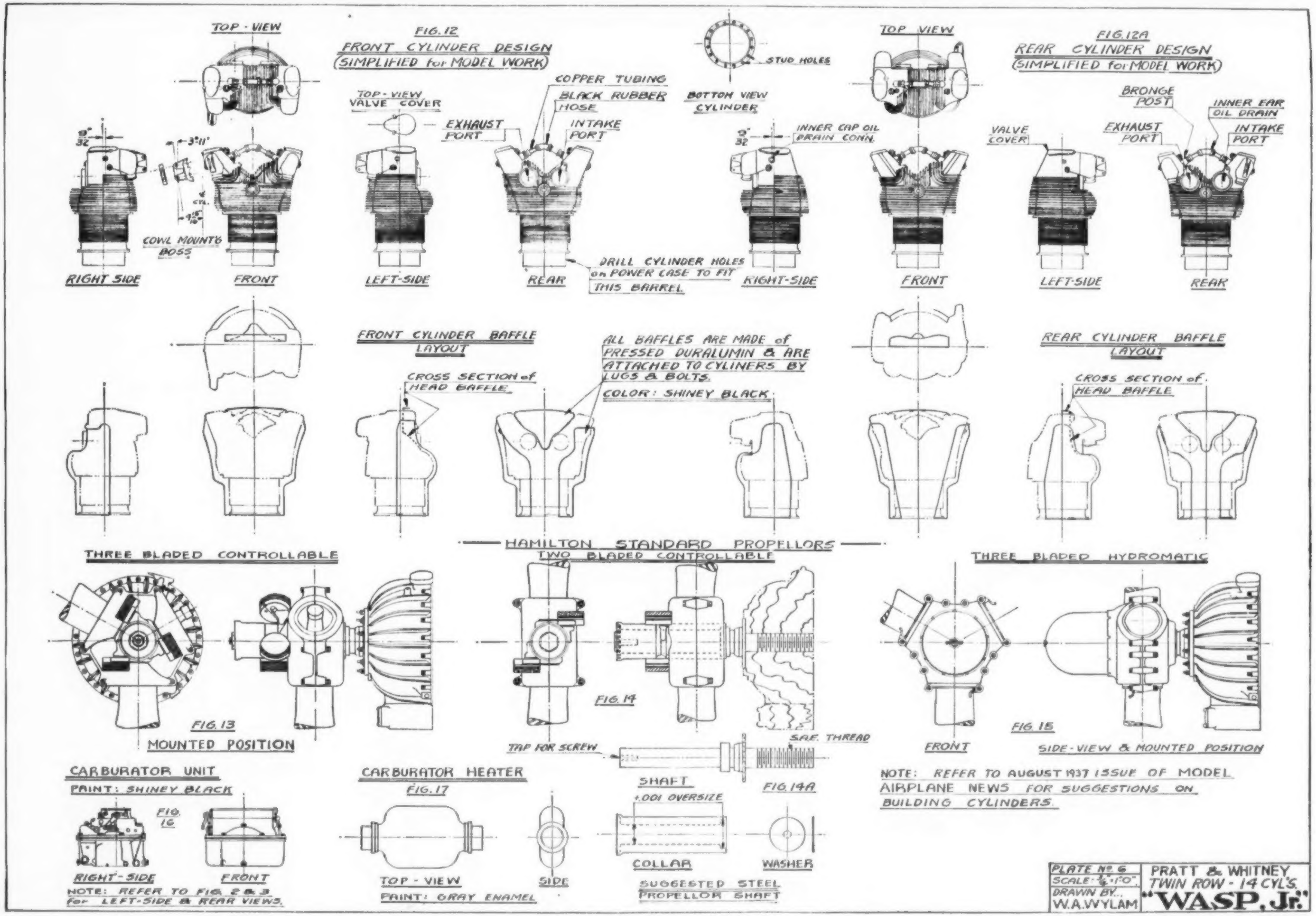
GEAR HOUSING SECTION: The

(Continued on page 54)



Side view


PRATT & WHITNEY
TWIN ROW - 14 CYL'S.
"WASP, Jr."
PLATE Nº 5
SCALE: 1/4"=1'0"
DRAWN BY... W.A. WYLAM
FIG. 6 TRUE SHAPE GEAR HOUSING
TRUE SHAPE of RIB
GASKET
ROUND ALL CORNERS
FINISH FRONT VIEW
TRADE MARK SEE PLATE Nº1
PAINT: GRAY ENAMEL
FIG.7 POWER CASE
TRUE SHAPE
FRONT VIEW
REAR VIEW
EXHAUST
INTAKE
BOLTS "UXZ"
TAPPET HOLES MINUS GUIDES
SECTION "B-B"
SECTION "G-G"
PAINT POWER CASE & ACCESSORY SECTION GRAY ENAMEL
DRILL HOLES HERE TO FIT BOLTS "UXZ"
FIG.8 SUPER CHARGER SECTION
SECTION "A-A"
BOLTS "MXR"
PAINT: GRAY ENAMEL
SIDE-VIEW
FIG.11 OIL SUMP DETAILS
FRONT-VIEW "JRL"
SIDE-VIEW
REAR-VIEW
BOTTOM VIEW
CONNECT OIL LINE "ABC" HERE
CONNECT OILLINE "DEG" HERE
CONNECT OILLINE "HIJ" HERE
COMMON OIL PLUGS
NOTE: SHAPE "JRL" TO FIT POWER CASE AT POINTS "VRL" (FIG.7) (SEE ALSO, SIDE VIEW - FIG.2)
OIL BREATHER
FIG.9 ACCESSORY SECTION
TACHOMETER CON'N.
OIL INLET THERMO CONN.
VACUUM PUMP MOUNTING FLANGE
THIS PLATE SUPPORT MAGNETO 1/4" THICK
DRILL TO FIT BOLTS "MXR"
CONNECT OIL LINE "YW" HERE
OIL TANK VENT
OIL PRESSURE GUAGE CONN.
OIL PRESSURE RELIEF VALVE
CONNECT OIL LINE "HIJ" HERE
CONNECT OIL LINE "DEG" HERE
OIL OUTLET CONNECTION
FIG.10 WIRING HARNESS DETAILS
BRONGE FLEXIBLE WEAVED TUBING
ALUMINUM MANIFOLD
MAGNETO SHINEY AMBER
BROWN BAKELITE FINISH
BLACK RUBBER COVERING
NOTE: ALL DRAWINGS ON THIS PAGE WERE SIMPLIFIED FOR MODEL WORK.


TOP - VIEW
FIG. 12
FRONT CYLINDER DESIGN
(SIMPLIFIED for MODEL WORK)
TOP - VIEW
VALVE COVER
COPPER TUBING
BLACK RUBBER
HOSE
EXHAUST
PORT
INTAKE
PORT
COWL MOUNTG
BOSS
RIGHT SIDE
FRONT
LEFT-SIDE
REAR
DRILL CYLINDER HOLES
on POWER CASE TO FIT
THIS BARREL
STUD HOLES
BOTTOM VIEW
CYLINDER
INNER CAP OIL
DRAIN CONN.
TOP VIEW
FIG. 12A
REAR CYLINDER DESIGN
(SIMPLIFIED for MODEL WORK)
BRONGE
POST
INNER EAR
OIL DRAIN
VALVE
COVER
EXHAUST
PORT
INTAKE
PORT
RIGHT-SIDE
FRONT
LEFT-SIDE
REAR
FRONT CYLINDER BAFFLE
LAYOUT
CROSS SECTION of
HEAD BAFFLE
ALL BAFFLES ARE MADE of
PRESSED DURALUMIN & ARE
ATTACHED TO CYLINERS BY
LUGS & BOLTS.
COLOR: SHINEY BLACK
REAR CYLINDER BAFFLE
LAYOUT
CROSS SECTION of
HEAD BAFFLE
HAMILTON STANDARD PROPELLORS
THREE BLADED CONTROLLABLE
TWO BLADED CONTROLLABLE
THREE BLADED HYDROMATIC
FIG. 13
MOUNTED POSITION
FIG. 14
FIG. 15
FRONT
SIDE-VIEW & MOUNTED POSITION
TAP FOR SCREW
S.A.E. THREAD
SHAFT
.001 OVERSIZE
FIG. 14A
CARBURATOR UNIT
PAINT: SHINEY BLACK
FIG. 16
RIGHT-SIDE
FRONT
NOTE: REFER TO FIG. 2 & 3
for LEFT-SIDE & REAR VIEWS.
CARBURATOR HEATER
FIG. 17
TOP - VIEW
SIDE
PAINT: GRAY ENAMEL
COLLAR
WASHER
SUGGESTED STEEL
PROPELLOR SHAFT
NOTE: REFER TO AUGUST 1937 ISSUE OF MODEL
AIRPLANE NEWS FOR SUGGESTIONS ON
BUILDING CYLINDERS.
PLATE Nº 6
DRAWN BY...
W.A.WYLAM
PRATT & WHITNEY
TWIN ROW - 14 CYL'S.
"WASP, Jr."

MODELING YOUR FUTURE IN AVIATION

Official Air Youth course in elementary aeronautics

by CHARLES H. GRANT

This latest type molded wood and plastic light sportplane, boasting a retractable landing gear, features both light weight and low drag

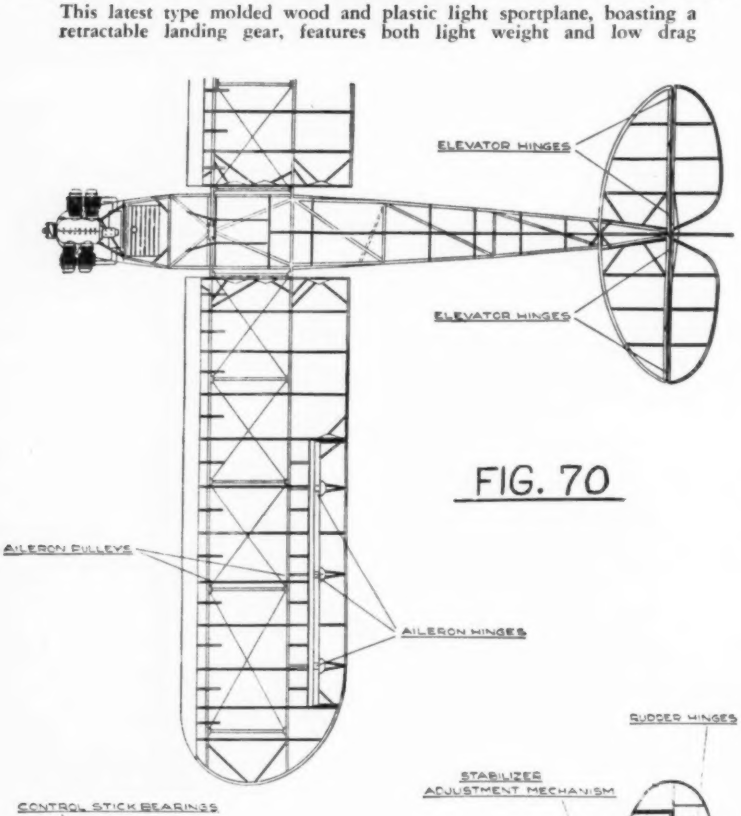


FIG. 70

LESSON 8

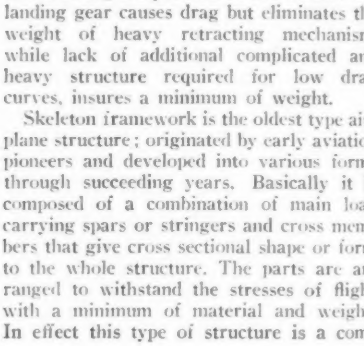
Advantages and disadvantages of internal frame structures—How to build a scale model glider of an Army Cub liaison plane

WEIGHT reduces the performance of low-powered airplanes more than any other factor. Of course drag or air resistance to forward flight also reduces performance, and the power required increases with drag, but at speeds below 170 miles per hour attempts to reduce drag by streamlining usually result in such heavy structure that more power is required in spite of drag reduction.

Drag chiefly affects an airplane's maximum speed, while weight affects landing speed and climb. So in light commercial or military liaison planes, where low landing speed and steep climb are most essential, weight considerations, rather than drag, dictate structural design. Of course drag is reduced wherever possible provided an increase in weight is not involved.

It is not surprising therefore that heavy metal skin-stressed construction is seldom used in planes of this type. The comparatively light internally stressed cloth-covered frame structure prevails in nearly all low powered planes; for example, Piper Cub, Fairchild, Monocoupe, etc. Whenever skin-stressed structure is employed it is of wood. Fig. 70 shows the uncovered frame structure of the stressed frame type, while Fig. 71 shows a stressed-skin type plane with wood frame covered with thin wood veneer. A completed modern type low powered Army liaison plane is shown in Fig. 72. Note the wing struts, non-retractable landing gear and square angular lines. All of these features are drag producing, but involve lightweight construction. Thus essential low landing speed is attained. By bracing the wings with struts instead of using cantilever wings, lighter wing spars and covering are possible. A non-retractable landing gear causes drag but eliminates the weight of heavy retracting mechanism, while lack of additional complicated and heavy structure required for low drag curves, insures a minimum of weight.

Skeleton framework is the oldest type airplane structure; originated by early aviation pioneers and developed into various forms through succeeding years. Basically it is composed of a combination of main load carrying spars or stringers and cross members that give cross sectional shape or form to the whole structure. The parts are arranged to withstand the stresses of flight with a minimum of material and weight. In effect this type of structure is a com-



Army liaison plane converted from light Aeronca sportplane. The important feature is light weight rather than low drag

bination of "bridges" designed to carry flight loads. In early types of planes this trusswork was composed of wood, wire and metal fittings, Fig. 73. Later these materials were in large part eliminated in favor of metal members of various structural forms held together with rivets or welded, or steel tubes welded at the joints. At the present time most low-powered planes have welded steel tube frames, Fig. 70, but a trend toward wood skin-stressed (monocoque) construction is evident, Fig. 71. In some cases wood covering is impregnated with plastic to make it more durable and weatherproof.

All truss type plane structures are covered with cloth, usually linen. To this covering is added about six coats of airplane dope applied to make it airtight and waterproof. Colored dope is often used as a final coat to provide the desired decoration.

These trussed bridge-like structures are made in various shapes to form the numerous plane units. The wings, Fig. 70, are composed of two main spars, front and rear, supporting ribs attached to them at right angles, parallel to the direction of flight. Leading and trailing edge members run spanwise, attached to the ribs front and rear. At the wing tips these are usually joined by a curved tip member. Drag struts in the plane of the wing join the front and rear spars at intervals throughout their span. Between these and the spars diagonal wires are attached to prevent the wing from weaving forward or back from the effect of landing stresses or drag in flight respectively.

The ribs themselves are light trusses contoured to the wing section desired. The cloth transmits air pressure on the wings to the ribs, which carry it to the spars. These support the fuselage, engines and other units mounted on them.

The tail surfaces, stabilizer and fin, attached to the rear of the fuselage, are of similar construction but different in shape and size. The trailing edge of the horizontal tail surface is a separate unit or units hinged to the rear spar and movable up or down to serve as elevators. The trailing edge of the vertical tail surface serves as a rudder in a similar manner to turn the plane right or left.

Two hinged sections of the wing trailing edge, one near each tip, act as ailerons for maintaining lateral control and balance. One is turned upward to reduce the lift on one wing, while the second is turned down increasing the lift on the other wing. This action rolls the ship about its longitudinal axis that runs front to rear through the center of the airplane.

The fuselage is composed of two vertical side trusses with similar contours, joined to horizontal members, Fig. 70 and 73. The lengthwise members are called "longerons" and their shorter connecting parts, "struts."

If the frame is of wood, diagonal wires are commonly used in each panel to hold the rigid members together and prevent frame distortion, Fig. 73. In steel tube frames no wires are used, all parts being welded together rigidly at their joints, Fig. 70 and 75.

In some types the cloth covering is

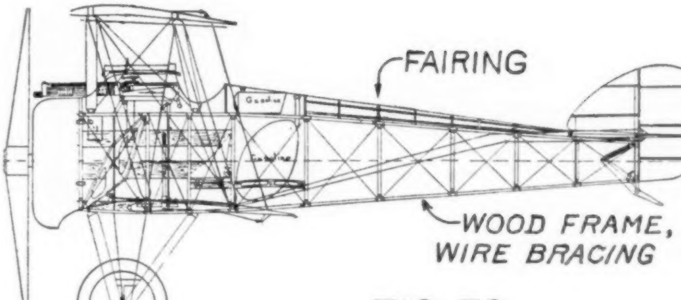


FIG. 73

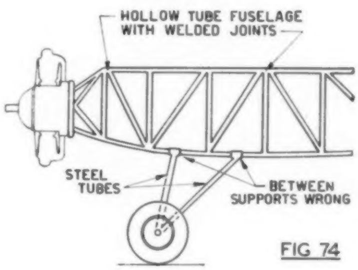


FIG 74

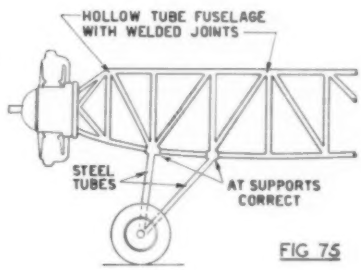


FIG 75

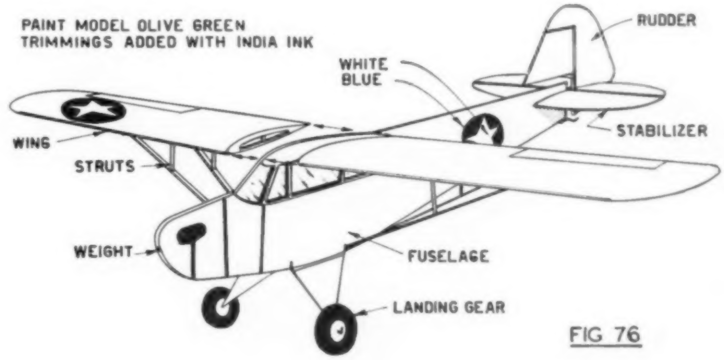
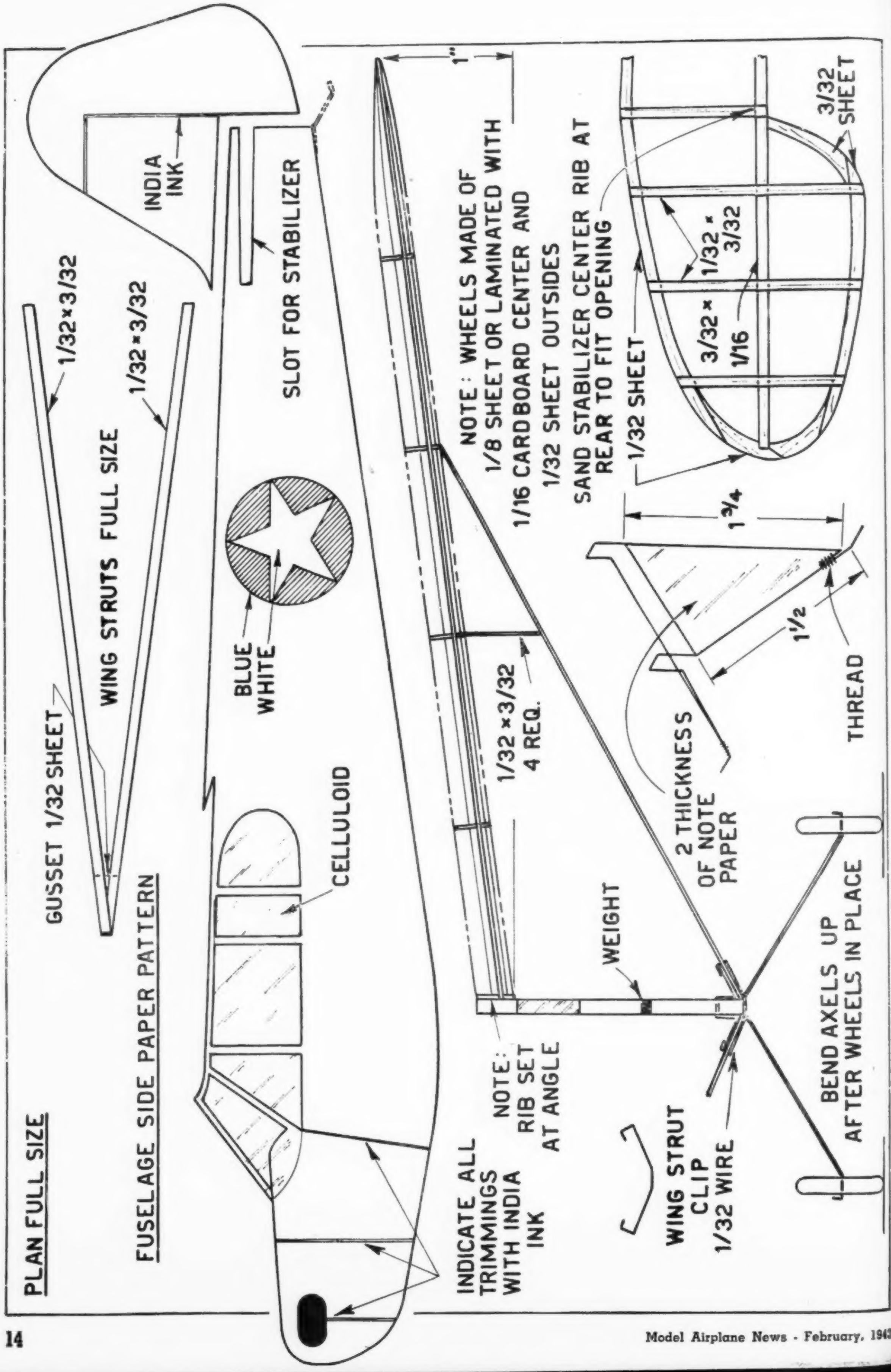


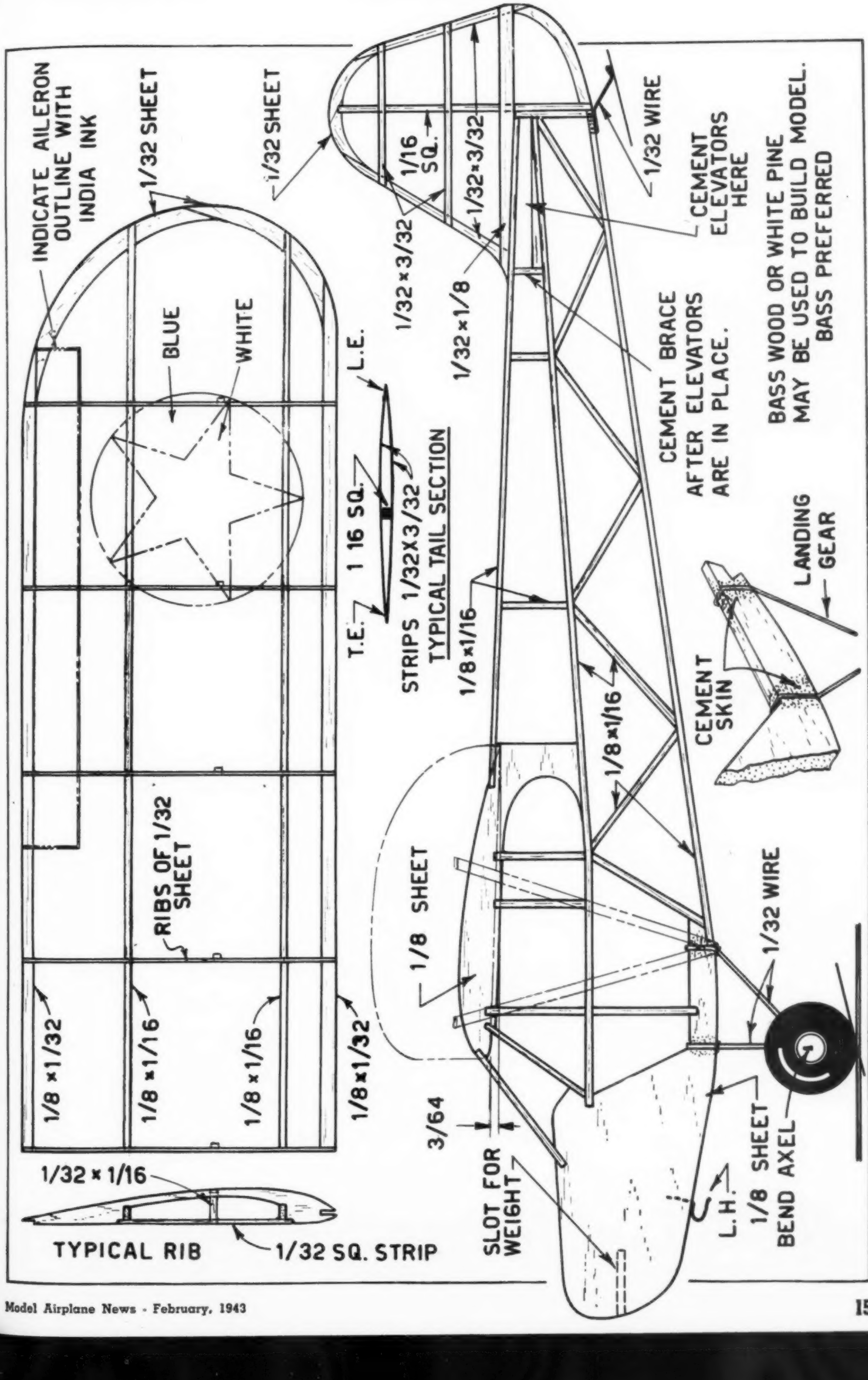
FIG 76

stretched directly over this angular frame, but in others a light super-structure of thin bulkheads and wood stringers is erected on the frame's top, bottom or sides to round out the angular contours, thereby reducing drag and providing more pleasing lines. This is called "fairing" and is shown on the top side of the fuselage in Fig. 73.

The fuselage serves as a connecting framework for all other structural units such as wings, tail and landing gear, and in single engine planes also encloses the powerplant, fuel tanks, miscellaneous equip-

(Continued on page 62)


PLAN FULL SIZE
FUSELAGE SIDE PAPER PATTERN
GUSSET 1/32 SHEET
WING STRUTS FULL SIZE
1/32×3/32
1/32×3/32
INDIA INK
SLOT FOR STABILIZER
CELLULOID
BLUE
WHITE
INDICATE ALL TRIMMINGS WITH INDIA INK
1"
NOTE: WHEELS MADE OF 1/8 SHEET OR LAMINATED WITH 1/16 CARDBOARD CENTER AND 1/32 SHEET OUTSIDES
SAND STABILIZER CENTER RIB AT REAR TO FIT OPENING
1/32×3/32
4 REQ.
WEIGHT
NOTE: RIB SET AT ANGLE
1/32 SHEET
3/32×1/16
1/32×3/32
3/32 SHEET
1 3/4
1 1/2
2 THICKNESS OF NOTE PAPER
THREAD
WING STRUT CLIP 1/32 WIRE
BEND AXELS UP AFTER WHEELS IN PLACE



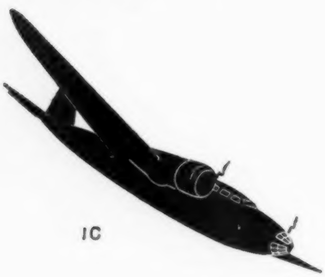
INDICATE AILERON OUTLINE WITH INDIA INK
1/32 SHEET
1/32 SHEET
BLUE
WHITE
RIBS OF 1/32 SHEET
1/8 ×1/32
1/8 ×1/16
1/8 ×1/16
1/8×1/32
1/32 × 1/16
TYPICAL RIB
1/32 SQ. STRIP
1/16 SQ.
1/32×3/32
1/32×3/32
1/32×1/8
L.E.
1 16 SQ.
T.E.
STRIPS 1/32X3/32
TYPICAL TAIL SECTION
1/8×1/16
1/8×1/16
1/8 SHEET
3/64
SLOT FOR WEIGHT
1/32 WIRE
CEMENT ELEVATORS HERE
CEMENT BRACE AFTER ELEVATORS ARE IN PLACE.
BASS WOOD OR WHITE PINE MAY BE USED TO BUILD MODEL. BASS PREFERRED
LANDING GEAR
CEMENT SKIN
1/32 WIRE
1/8 SHEET
BEND AXEL
L.H.

SKY SCOUTS

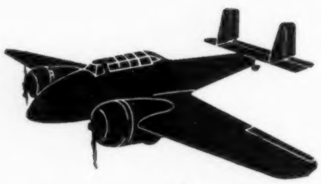
Learn to spot enemy planes and help defend America

1A

1B



1C



1D

2A

2B

2C

2D

Silhouette Review

ONE year ago Sky Scouts was organized by MODEL AIRPLANE NEWS to help train the youth of our nation in spotting airplanes.

Each month during the past year silhouettes of enemy aircraft were presented in order to give practice in spotting to all who joined the organization. A complete description of the various planes accompanied the silhouettes.

Anyone could join; naturally there were some qualifications. To qualify as a Sky Scout the names of each ship in 2 sets of silhouettes had to be sent in to Sky Scout headquarters; MODEL AIRPLANE NEWS, 551 Fifth Avenue, New York City; whereupon a silver Sky Scout pin was sent to the qualifying members. To become an Expert Sky Scout names of 12 sets of planes had to be submitted. Those who submitted all 12 sets qualified as Expert Sky Scouts and will receive a gold Sky Scout pin.

Many have enrolled during the twelve months; some several months after the first silhouettes appeared. Consequently they have not been able to send in answers to silhouettes they have missed. However, now that all 12 sets have been printed we are presenting a resume of these, 4 sets each month, so that if any silhouettes have been missed by members they will have a chance to send in the names of each silhouette printed. Due to metal priorities, however, these latecomers will not receive the gold pin.

Names and descriptions accompany the silhouettes so as to help members concentrate on the characteristics of the silhouette. Naturally in order to pick out the right name the silhouettes should be examined. This serves as excellent practice.

So, all Scouts who have not sent in the 12 sets of answers—get busy—and as they are reprinted look them over and send us the names. In this issue 4 sets with descriptions are given.

If you have formed units and hold meetings it will be helpful if you clip out the silhouettes or make copies of them and paste them on your bulletin board. In this way silhouettes of enemy ships will be constantly before you and it will not be long before you will become familiar with all their characteristics.

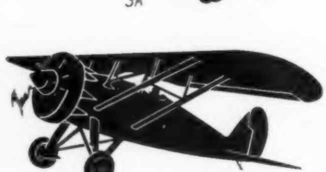
DESCRIPTIONS OF SILHOUETTES FOR SETS No. 1, 2, 3 AND 4

PLANE 1A—Mitsubishi twin engine long-range bomber used by the Japanese Imperial Army Air Corps is an all metal mid-wing monoplane with a retractable landing gear. Equipped with two 900 hp. Mitsubishi Kinsei air-cooled radial engines; accommodates a crew of three to five. Models similar to this were also designed as freight carriers for the Japan Airways Company for "survey" flights from Tokyo to Teheran as early as April 1939. Dimensions: Span, 82 ft.; length, 52 ft. 6 in.; height, 12 ft. 1½ in. Weight, loaded, 11,000 lbs. Cruising speed, 162 m.p.h.; endurance, 10 hours.

PLANE 1B—Mitsubishi "Karigane" Mk. II (Wild Goose), a single engine two place high performance fighter capable of great flight range is used in appreciable numbers by the Japanese Imperial Army Air Corps. Powered with an 800 hp. Mitsubishi A-14 fourteen cylinder radial air-cooled engine equipped with standard NACA cowl and constant speed Hamilton Standard two-blade propeller, the ship has cantilever wing design with fixed undercarriage, of metal structure with flush riveted sheet metal covering. Ailerons are fabric covered. Split-type trailing edge flaps are placed beneath fuselage, extending to within three feet of each aileron. Fuselage is monocoque with oval crossection. Fixed sections of the tail surfaces are also metal covered, movable portions are fabric covered. Cockpit enclosure begins at about the center of the wing section, extends backwards flowing into the vertical tail surface. Pilot is located at forward cockpit while full navigational and communication facilities are incorporated into the aft pit for an observer. Dimensions: Span, 39 ft. 5 in.; length, 27 ft. 11 in.; height, 11 ft. 6 in.; wing area, 258 sq. ft. Weight, loaded, 5,060

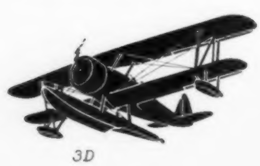
(Continued on page 60)

3A



3B

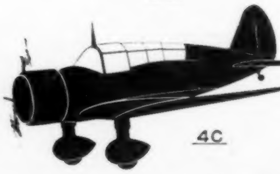
3C



3D

4A

4B



4C

DESIGN FOR PERFORMANCE

A simple method of calculating performance of model planes by a combination of theory and experiment

by

ROY MARQUARDT

WHAT sort of a model builder are you? We know of at least two general types. One, Bill, builds models for pure relaxation and is very happy if only they will fly or maybe just look realistic; while the other, Johnny, is always striving to build better and better models. We have no quarrel with Bill for we've built lots of models that way ourselves; yet we're sort of glad that there are getting to be more and more Johnnies for airplanes are going to be mighty important after this war is over and we're convinced that building models is the easiest way to learn the fundamentals of aeronautics.

Bill isn't going to be much interested in our present series of articles, but if you're like Johnny you should get a big kick out of them for we're going to apply everything that modern aerodynamics has to offer in a big attempt to improve model design. Fortunately, it's possible to use easy-to-read charts instead of formulae; but just in case some of you might feel slighted we're including fairly complete mathematical discussions at the end of several of the chapters.

Well, let's examine a few general methods that Johnny might use to improve his models. In the first place, he might just build model after model systematically varying one thing at a time so he could be sure of the effect of every variation. This is basically sound and, in fact, it's the general method most of us have used although gosh knows the variations haven't been very systematic.

Unfortunately there's one trouble with the whole business; that is, we must measure the effect of the changes by actually flying the models. This is bound to lead to crude data due to air currents, variations in adjustment and what have you. We'll find as a result that present models are far from perfect aerodynamically!

In an attempt to eliminate this flight test bugaboo, model builders gradually have begun to follow the lead of full-scale designers and use the results of wind tunnel tests. The development of wind tunnels has been covered in so many other places[1] that we'll skip directly to their advantages; the most important being that undesired air currents can be eliminated, the angle of attack exactly fixed and forces measured. As an additional advantage, various items such as wing, tail and fuselage can be tested separately thus immediately locating the source of erroneous designs.

Well, obviously the first question to arise is: Can we use the tremendous stack of wind tunnel data accumulated by full scale designers or do we have to measure our

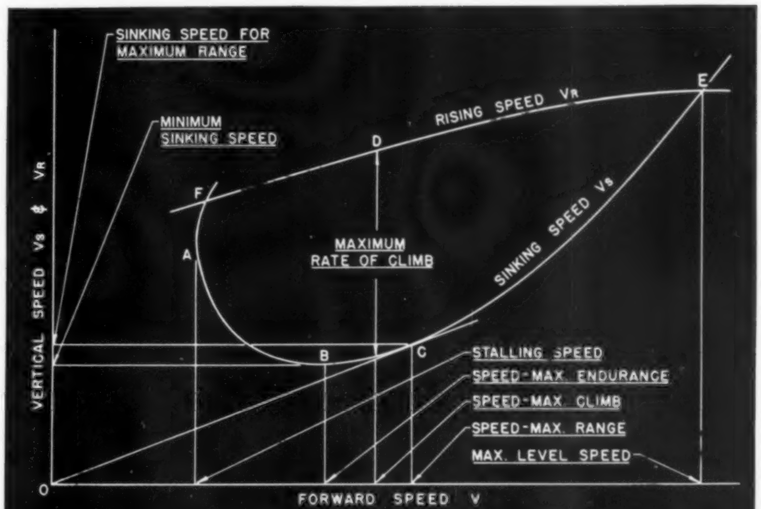


FIG. 1.1 BASIC PERFORMANCE CURVES

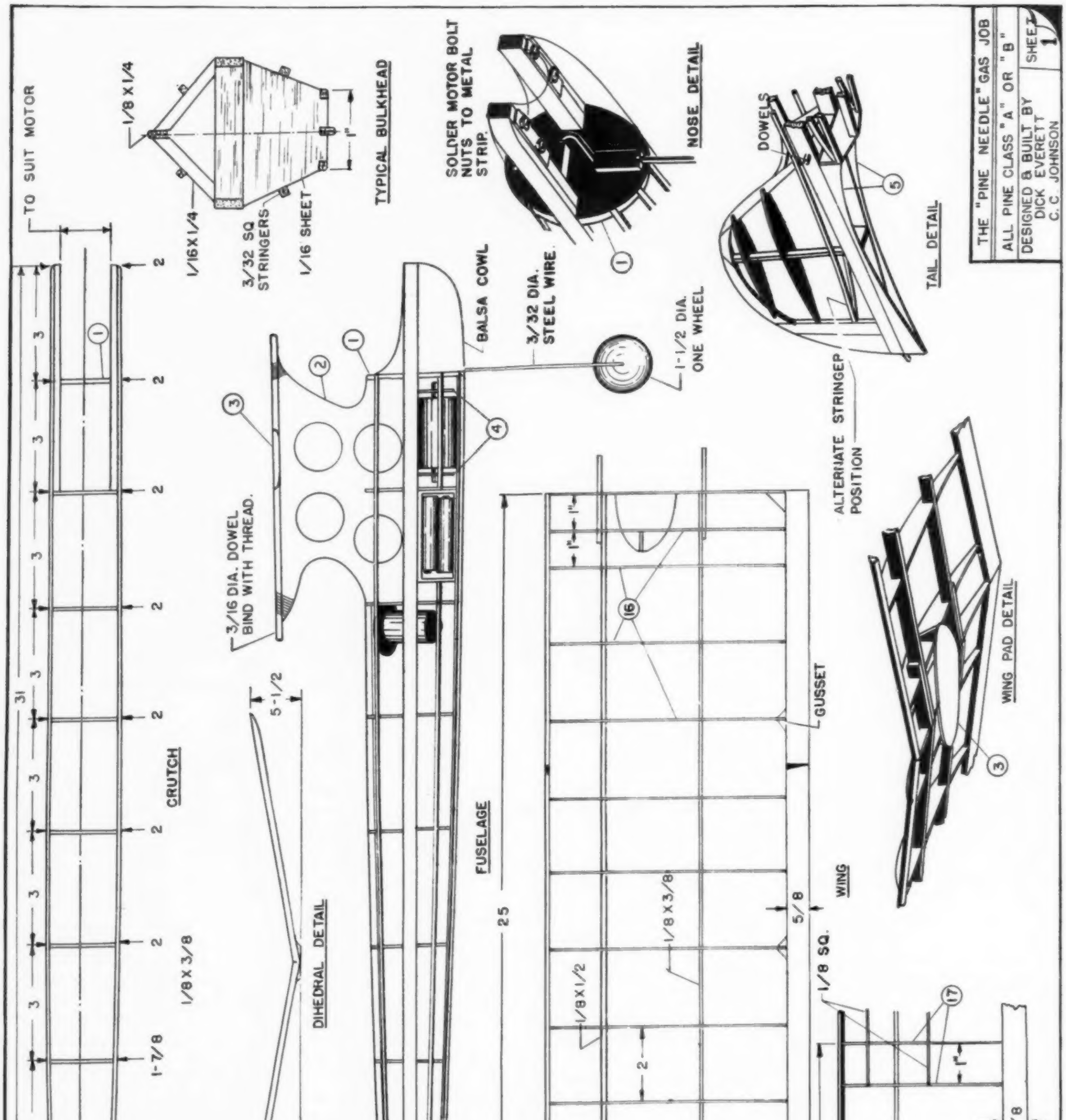
own? Most of us first felt that we must follow the latter course. Classic tests in this direction were made by McBride[2] on the airfoils used by the high ten indoor models in the 1930 Nationals. Soon thereafter extensive tests on fuselage and indoor model airfoils were started at Boston[3] and at the same time the writer supervised tests on wings of various sizes, aspect ratio and airfoils[4] at Burlington, Ia. Unfortunately wind tunnel testing is quite an art and none of the results in the above references can be accepted without a grain of salt. Don't take us wrongly, it isn't impossible for model builders to obtain accurate wind tunnel data but the odds are pretty high against it. You can't just put a wing behind an electric fan and expect to get results much superior to those obtained from flight test!

Luckily, we were completely wrong and it isn't necessary to make all of our own tests. In fact, it is possible to use much of data already obtained by wind tunnels all over the world. However it is quite a problem to know the best way to use it. For instance, a direct attempt to systematically study this data was started recently by the writer[5], only to find the logical procedure was to set up a basic theory and then use wind tunnel data as a check. As a part of the study the writer filled reams of paper with an investigation (unpublished) of our fundamental problem—that is, the variation of flying characteristics with model size (so as to know how far full scale data would be applied), when suddenly the application of a little theory allowed an exact calculation and made nine-tenths of the experimental data unnecessary. (Don't forget though that the other one-tenth of the data is still needed.)

This theoretical-experimental method is exactly the same as is used by most full scale aerodynamicists; in fact, it's not completely new to the model field, a notable attempt having been made by Weiss to introduce the Oswald method of flight prediction.[6] Unhappily, the Oswald and latter methods developed by Rockefeller[7] and White and Martin[8] (also introduced at Cal Tech) are extremely unsuited to our needs. In the first place they are all based on the same approximation which gives very inaccurate estimates of minimum sinking speed which is just what most of us are interested in. Secondly, all three methods neglect the special effects of our small models and low speeds. For example, take the problem of the best aspect ratio for endurance. Here from airflow considerations alone the Oswald method tells us to use an infinitely high aspect ratio whereas the analysis which we are about to develop shows definitely that this so-called aerodynamic optimum aspect ratio lies between 5 and 30 depending on the particular model. And there's a long, long jump from 5 to infinity.

But enough of this lengthy introduction. Our problem then is to work out a general method of calculating the performance of a model airplane: its rate of climb, high speed, sinking speed, endurance, etc., and show how they are affected by airfoil selection, aspect ratio, wing loading and fuselage drag. As most modelers are only interested in endurance or possibly high speed we shall stick mostly to these two calculations. As a final chapter we shall investigate the stability problem; incidentally, this is a honey as it's easily shown that the "dirtier" an airplane is the more stable it will be—unless we—but whoa, we're get-

(Continued on page 59)

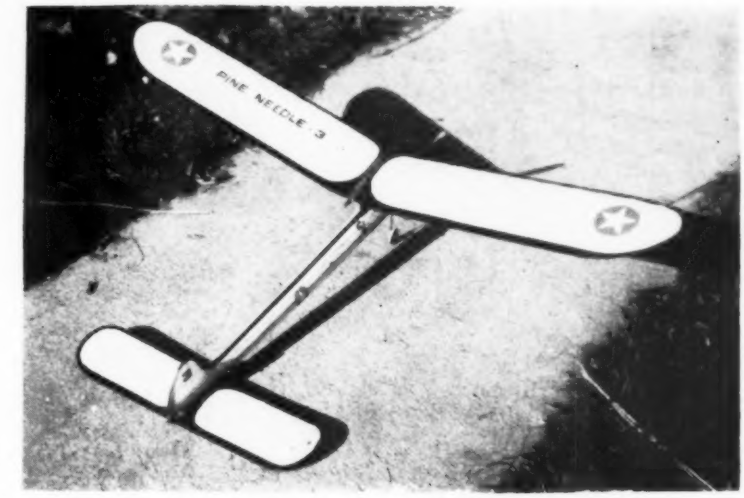


THE "PINE NEEDLE" GAS JOB
ALL PINE CLASS "A" OR "B"
DESIGNED & BUILT BY
DICK EVERETT
C. C. JOHNSON
SHEET 1
TO SUIT MOTOR
1/8 X 1/4
1/16 X 1/4
3/32 SQ STRINGERS
1/16 SHEET
TYPICAL BULKHEAD
SOLDER MOTOR BOLT NUTS TO METAL STRIP.
NOSE DETAIL
DOWELS
TAIL DETAIL
BALSA COWL
3/32 DIA. STEEL WIRE.
1-1/2 DIA. ONE WHEEL
ALTERNATE STRINGER POSITION
3/16 DIA. DOWEL BIND WITH THREAD.
CRUTCH
DIHEDRAL DETAIL
FUSELAGE
WING PAD DETAIL
GUSSET
WING
1/8 X 3/8
1/8 X 1/2
1/8 SQ.
3/16 SQ.
1/8 X 1/4
STAB
31
25
11
5-1/2
5/8

"PINE NEEDLE" EXPLODES A MYTH

Though made of hardwood this tough, easily built little gas model performs like a balsa job

by DICK EVERETT



Large wing and slender frame give it high performance

THIS little model gets its name from the material used in constructing the original. Hardwood (pine) was used with many misgivings, but the little ship proved a pleasant surprise. The one thing learned was that substituting hardwood for balsa did not make construction as difficult as supposed.

Pine was used on the original ship but basswood will do equally as well*, and after your first flight we are sure that the "bugaboo" of hardwood will be dispelled from your mind.

Though designed to take care of those matched Ohlssons, the 19 and 23, you will find that this ship will take a large variety of motors; the motor mounts are so designed that you can change them to take care of any motor on hand. The ship is very stable and has taken all power available—turning in some very fine flights. After preliminary test flights, averages of more than 2:19 were taken many times, flying over three minutes on single flights with a fifteen second motor run. The Ohlsson 19 will not take it up as fast as the 23 but average time is almost the same. The gliding ability of this ship is amazing, soaring on the slightest current and turning in a very flat glide when not soaring.

The pine model is not hard to build and its weight compares admirably with balsa models of equal size (18-1/2 oz.). Its strength is far greater than the balsa model and it is easier to work with than you may imagine. After constructing three models, a small C this A & B and a U-Control, and after seeing two other models built, the combined experience of all five is had in this model. The only balsa on her is the cowling. You will be able to get these small blocks for the duration, for the companies that are using balsa for life rafts, etc., have numerous scraps cut from the end of planks which they can sell to the model companies, so don't worry about cowlings. Ordinary model cement has proved more than able to securely hold the pine, *if* you use a cement fill-it: that is, a drop or two of cement around the joint.

For longitudinal members both on the wing and fuselage, butt joints were frowned upon: the spliced joint being so much stronger by allowing more cementing surface and not weakening the wood. Two tools which come in very handy are the sandpaper blocks and a good sharp knife. Razor blades will cut out ribs with the greatest of ease but the thicker wood cuts easier with a knife.

Allowing a little more time for construction, the pine model is better than the balsa and your author predicts you will never build an all balsa gas model as long as hardwoods are available for spars and longerons. For those of you who still have balsa, the model will be a little lighter if balsa is used for the ribs. So much for the talk; let's get to work. Take your time, use plenty of elbow grease on the sandpaper and the results will be a ship you will be proud of and one which will win contests even against all balsa models.

Fuselage: As usual the crutch and the entire upper half of the fuselage is built first. Wing mount is cemented on after the lightening holes are cut in the 3/16" plywood. Rudder and stringers are then added. The crutch is then ready to be taken from the board. The front bulkhead and motor mounts are then added using plenty of cement on this. The wing mount is strengthened by adding the small gussets of pine. Wing platform is added with the triangular blocks and allowed to dry.

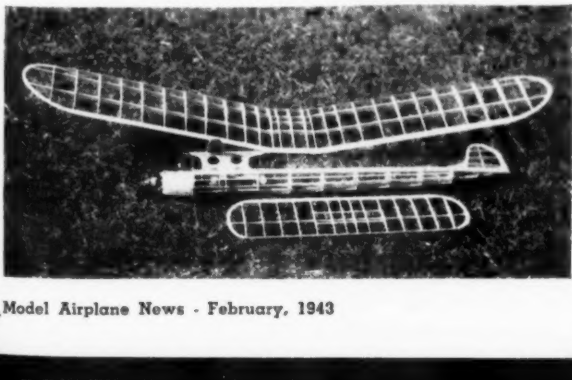
While this is drying the inside of the cowling can be shaped and cemented to the "fuse." When this is in place the bottom formers are added. Now add the motor, coil, condenser and battery box, and the ship is wired for the ignition.

The crate balances with the parts where shown on the drawing so don't worry about balance. A plastic battery box and timer was used and will really work swell. Put plenty of cement around the coil and battery box for they are the two objects that have weight in them and will knock loose before the other parts, so to save repair at a later date use plenty. The stringers and stab mount are added and the entire fuselage sanded very well. Pegs for the wing and tail are attached and the fuselage is then complete; this is the majority of the work. The landing

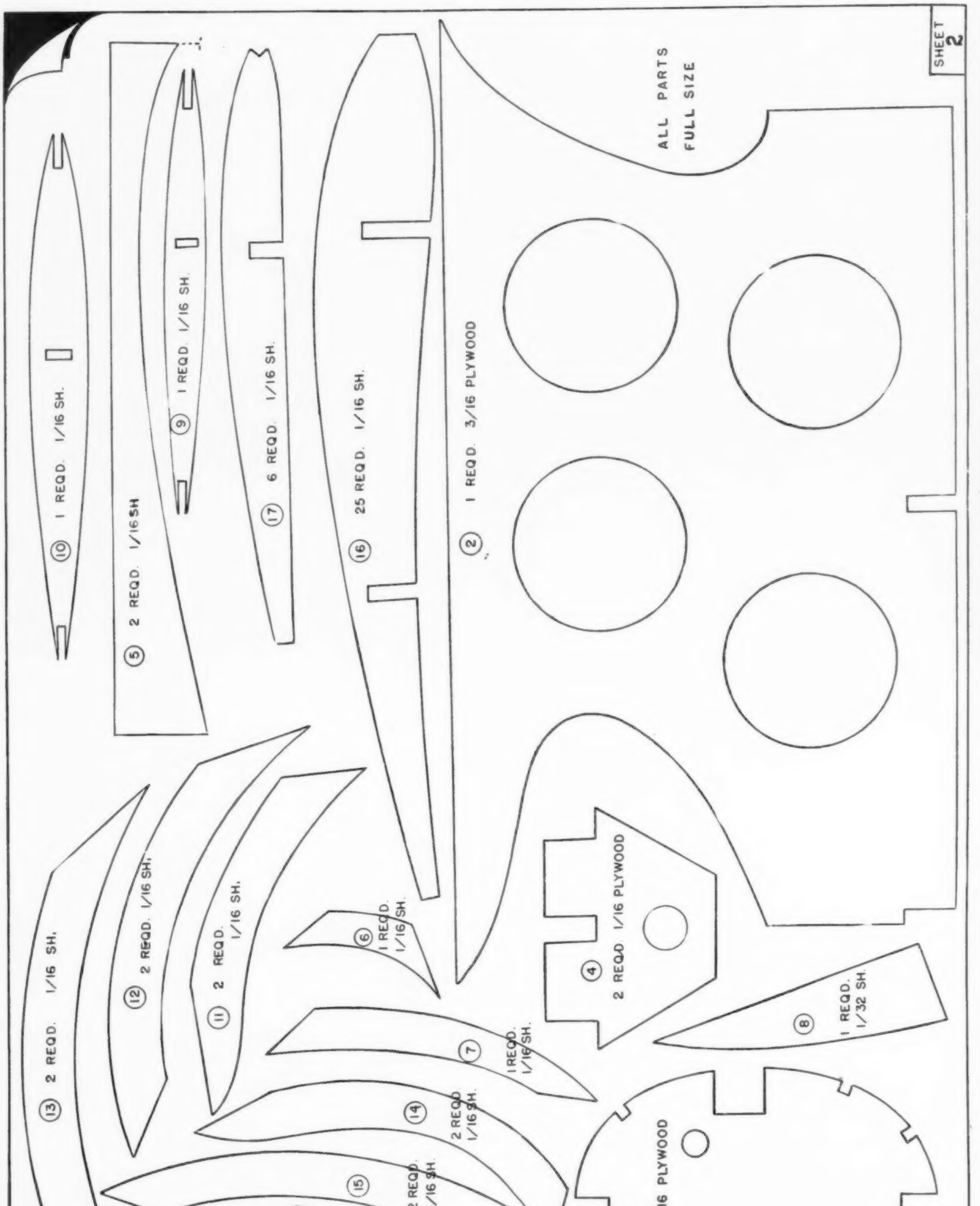
(Continued on page 40)

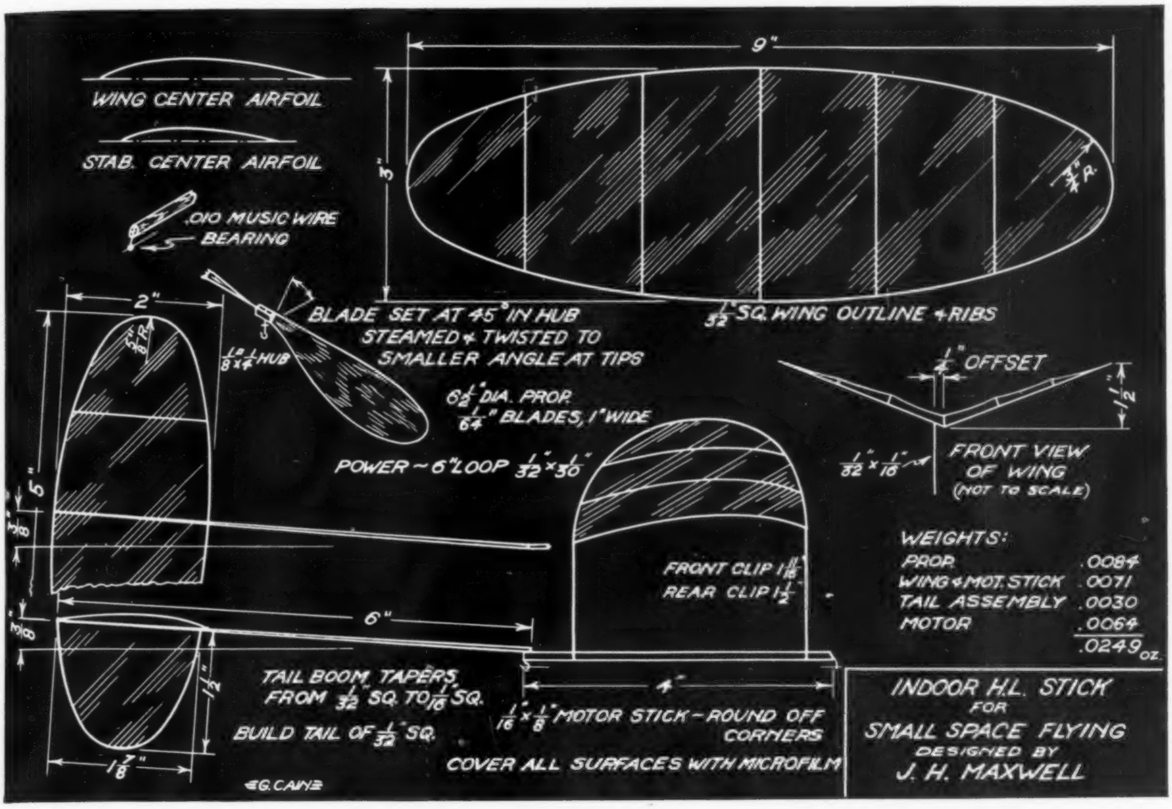
*Basswood is suggested instead of pine as extensive tests have shown that pine is comparatively brittle and shears easily upon impact, when compared to the resisting qualities of basswood. Basswood has all of the four qualities for model construction: even homogeneous grain, freedom from knots, resistance to splintering, toughness. It is easy to cut, steam and bend.

It is composed of simple units, easy to build



Only one wheel is necessary because of its quick takeoff


SHEET 2
ALL PARTS FULL SIZE
10 1 REQD. 1/16 SH.
5 2 REQD. 1/16 SH
9 1 REQD. 1/16 SH.
17 6 REQD. 1/16 SH.
16 25 REQD. 1/16 SH.
2 1 REQD. 3/16 PLYWOOD
13 2 REQD. 1/16 SH.
12 2 REQD. 1/16 SH.
11 2 REQD. 1/16 SH.
6 1 REQD. 1/16 SH.
4 2 REQD 1/16 PLYWOOD
8 1 REQD. 1/32 SH.
7 1 REQD. 1/16 SH.
14 2 REQD 1/16 SH.
15 2 REQD. 1/16 SH.
1 1 REQD. 3/16 PLYWOOD
3 1 REQD 1/16 SH
1 REQD 3/16 PLYWOOD



THE CLAUSTROPHOBIA CRATE

A reliable and easily built indoor model especially designed to fly in small enclosures

by B. P. MARCHI

HERE is an odd little indoor ship that comes to us from across troubled seas. No, we don't mean that it flew across the Atlantic Ocean. It's a novel model for flying in small halls or rooms: the design was developed in Glasgow, Scotland.

"Ah, ha!" you may say, "little wonder the parts are cut down so much."

But there you're wrong. It's not the Scotch ancestry in the designers that accounts for a small model or wee parts. It's just good design. But why not let the builder tell the story in his own words?

Specifications were received after the outbreak of hostilities "across the pond." The writer is Joseph H. Maxwell, well known Scottish modeler.

"Here in Glasgow," says Mr. Maxwell, designer of the claustrophobia crate, "we have several large halls, but it is difficult and expensive to secure the use of them. When I decided to try my hand at indoor models (I had the doubtful honor of introducing them to the Glasgow Model Airplane Club), I realized that the only place I could fly them was inside the club room which measured but 10 by 13 feet, and was only 11 feet high. And add to that a hanging light from the ceiling center.

"No doubt you American fellows, accustomed to flying in large areas such as airdocks, think such a flying space ridiculous. But we get lots of fun out of it.

"The first model we developed was a modified Class A rise-off-ground ship minus the landing gear. It proved too large for the limited flying space.

"After a few attempts, I developed this small model, which at present holds the club's indoor record of 3 minutes, 10 seconds. Considering the size of the room, we feel this endurance time is not too bad. Actually, the model is capable of much more time, for up to the time of writing, it was just a case of how many times the model could hit the walls and bounce off the light, without being grounded.

"The circle is very tight—about five feet in diameter. It's an amusing sight to fly several of these models at the same time in a small room."

The idea of a small-space indoor flying model so intrigued us, we thought other readers of MODEL AIRPLANE NEWS would be interested in seeing the Scottish ship and maybe trying their hand at turning out a similar model.

The title of "Claustrophobia Crate" seemed to fit rather well since most models could be expected to have a "morbid fear of being in confined places." But not this craft.

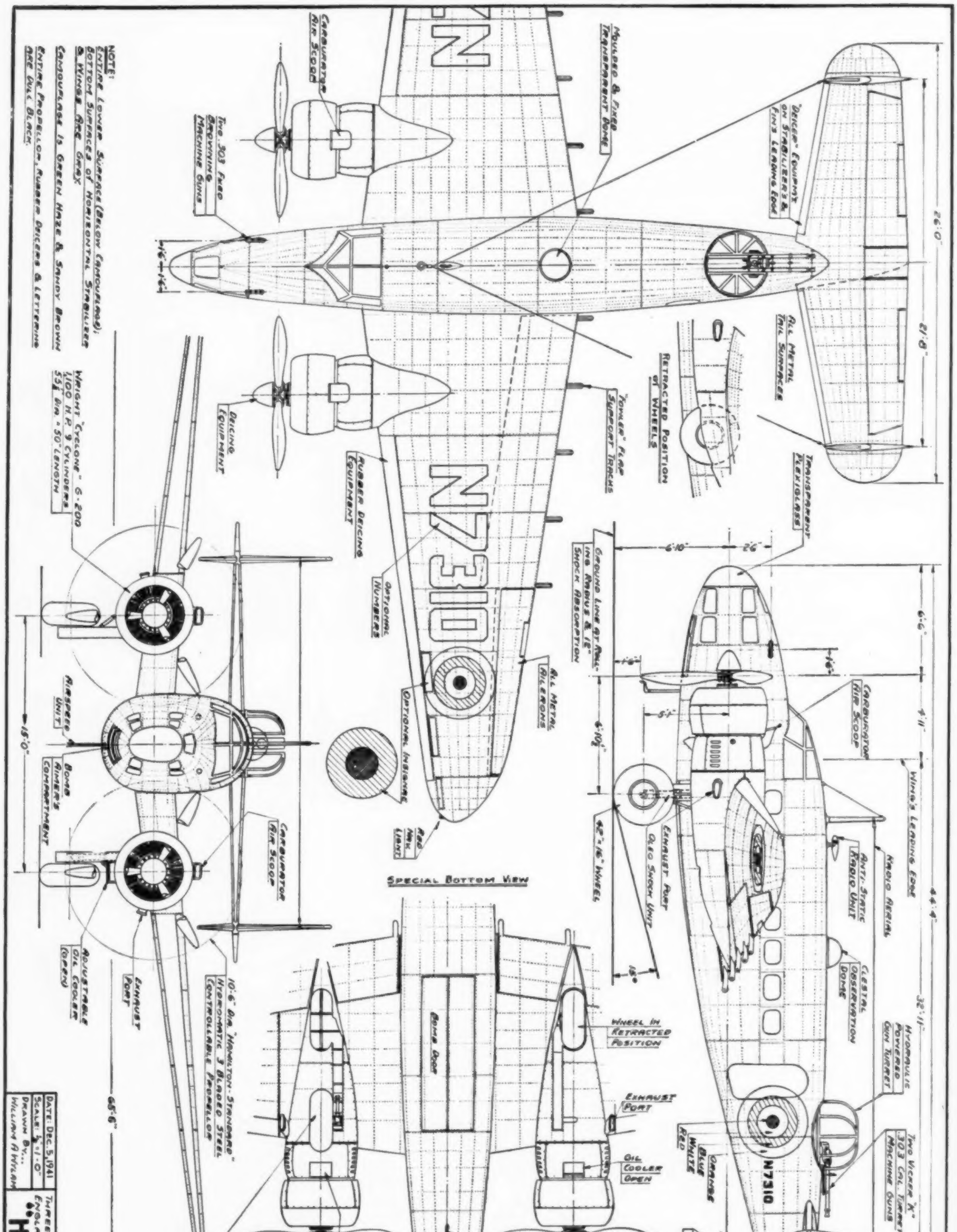
As it becomes increasingly more difficult to obtain suitable halls for regular indoor flying, and as the model airport problem becomes more acute, we offer the suggestion that both indoor and outdoor builders take a crack at constructing one of these parlor planes. It goes something like this:

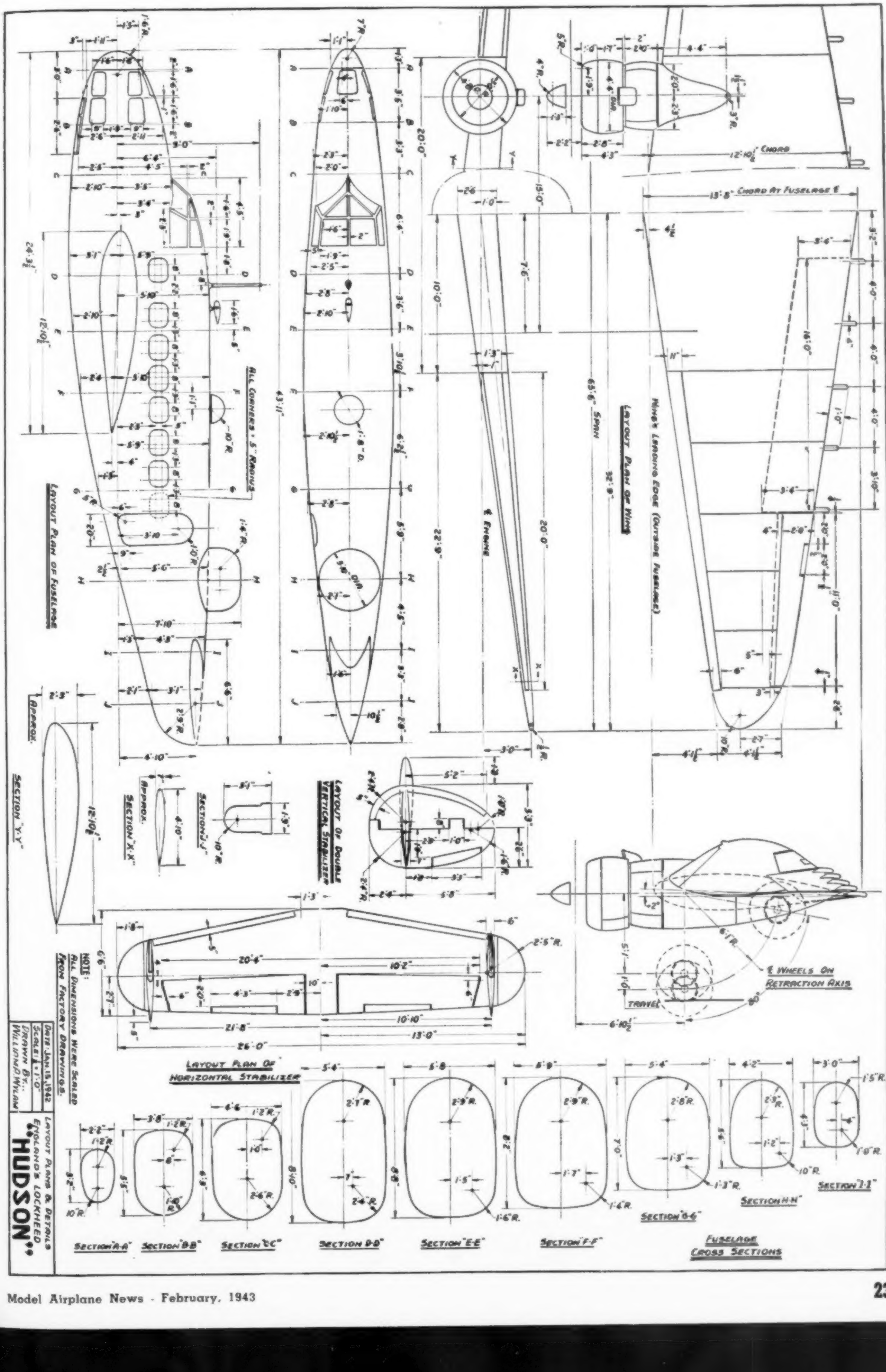
Motor Stick—constructed from light, clear grained balsa, 1/16 by 1/8 by 4 inches. You will find that in short lengths, the solid motor stick can more than hold its own with the popular hollow types as far as strength and lightness are concerned. The thrust bearing and rear hook, the only fittings required for the motor stick, are bent from .010 music wire.

Tail Boom—straight grained 1/16 inch square stock which tapers to 1/32 inch square at one end. Sand to shape carefully, round off corners.

Rudder—curved to shape by soaking strip balsa in water and then bending around a cardboard template. If you're in a hurry, the balsa may be bent around a hot soldering iron, but much care must be exercised or the wood will be scorched and weakened. The wood used is 1/32

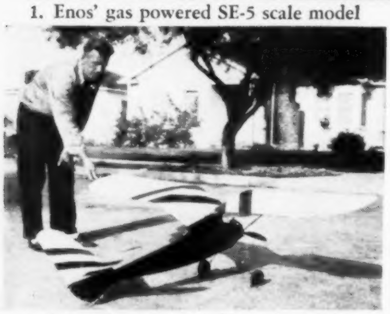
(Continued on page 60)


"HUDSON"
Three-View Plan & Details
England's Lockheed "Hudson"
Date: Dec. 5, 1941
Scale: 1/8" = 1'-0"
Drawn By: William A. Wylam
NOTE: Entire lower surface (below camouflage), bottom surfaces of horizontal stabilizer & wings are gray.
Camouflage is green haze & sandy brown.
Entire propellor, rubber deicers & lettering are dull black.
Wright "Cyclone" G-200
1100 H.P. 9 cylinders
55¼" Dia. × 50" Length
Carburetor Air Scoop
Two .303 Fixed Browning Machine Guns
Moulded & Fixed Transparent Dome
"Deicer" Equipment on Stabilizers & Fins Leading Edge
All Metal Tail Surfaces
Retracted Position of Wheels
"Fowler" Flap Support Tracks
Deicing Equipment
Rubber Deicing Equipment
Optional Numbers
Optional Insignia
All Metal Ailerons
Red Nav. Light
N7310
Transparent Plexiglass
Ground Line at Rolling Radius & 12" Shock Absorption
Carburetor Air Scoop
Wing's Leading Edge
Radio Aerial
Anti-Static Radio Unit
Exhaust Port
Oleo Shock Unit
42"×16" Wheel
Celestial Observation Dome
Hydraulic Powered Gun Turret
Two Vickers "K" .303 Cal. Turret Machine Guns
18.3" Pneumatic 360° Swiveling
Red
White
Blue
Orange
Special Bottom View
Bomb Door
Wheel in Retracted Position
Exhaust Port
Oil Cooler Open
Airspeed Unit
Bomb Aimer's Compartment
Wheels in Extended Position
Oil Cooler Closed
10'6" Dia. "Hamilton-Standard" Hydromatic 3 Bladed Steel Controllable Propellor
Adjustable Oil Cooler (Open)
Exhaust Port
Airspeed Unit
Bomb Aimer's Compartment
Carburetor Air Scoop

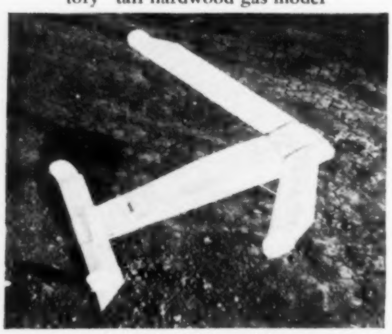


LAYOUT PLAN OF FUSELAGE
ALL CORNERS 5" RADIUS
LAYOUT PLAN OF WING
WING'S LEADING EDGE (OUTSIDE FUSELAGE)
65'6" SPAN
℄ ENGINE
13'8" CHORD AT FUSELAGE ℄
12'10½" CHORD
SECTION "Y-Y"
APPROX.
SECTION "X-X"
APPROX.
SECTION "J-J"
LAYOUT OF DOUBLE VERTICAL STABILIZER
℄ WHEELS ON RETRACTION AXIS
TRAVEL
NOTE:
ALL DIMENSIONS WERE SCALED FROM FACTORY DRAWINGS.
LAYOUT PLAN OF HORIZONTAL STABILIZER
DATE JAN 15, 1942
SCALE 1/8"=1'0"
DRAWN BY: WILLIAM D. WYLAM
LAYOUT PLANS & DETAILS
ENGLAND'S LOCKHEED
"HUDSON"
SECTION "A-A"
SECTION "B-B"
SECTION "C-C"
SECTION "D-D"
SECTION "E-E"
SECTION "F-F"
SECTION "G-G"
SECTION "H-H"
SECTION "I-I"
FUSELAGE CROSS SECTIONS

1. Enos' gas powered SE-5 scale model



2. Harry Durant with his unique "victory" tail hardwood gas model



3. A freak Wakefield model that performs beautifully. *Below* 4. U-control pilots vie for speed honors at Los Angeles

AIR WAYS

News of model plane experimenters from all parts of the world

THOUGH many of our model builders have joined Uncle Sam's military services and production lines, they still retain their interest in experimenting with or news of model planes. Many write and tell us that they look forward to MODEL AIRPLANE NEWS every month and though they cannot build ships the way they used to, they read with great interest about activities of other fellows; in fact some have said that it has helped many times to pull them out of a stunt. So, we call upon you fellows on the Home Front not to let your pals down—keep a flow of news coming into "Air Ways" so that we can pass it on and let them know what you are doing.

One of the many things that interests them is accounts of contests held in various parts of the country. We have been most anxious to print a Schedule of Coming Events and also accounts of these contests after they have taken place; however contest directors and clubs have been very negligent in sending in news or any notification that we could pass on to their model buddies. We are most anxious to print a contest list but cannot do so unless we know what contests are going to be run. If contest directors are interested in having notices printed beforehand all they have to do is send in such notices to MODEL AIRPLANE NEWS *two months* in advance of publication date; we must have it this far in advance in order to get it into

5. George Haupt's Boeing P12-E model can be housed in a matchbox

6. Geoffrey Pike of England with his American designed stick model

7. An unusual flight picture of a model Boeing F4B4, built by S. Filchak

8. This Boeing scale model displays Stan Staples' beautiful workmanship

an issue that appears before the contest.

We are also going to ask all model builders who have joined the armed forces to send in their names and address. We intend to print an Honor Roll of all those in the services, provided we know who they are. If this is done we guarantee to keep you well supplied in mail from model builders at home.

As many of you know, "Scotty" Murray of Brooklyn, New York, heads our Honor Roll. He was the first one to join the armed service and the first one to give his life for his country. He was killed in air combat over Malta after knocking down four German bombers.

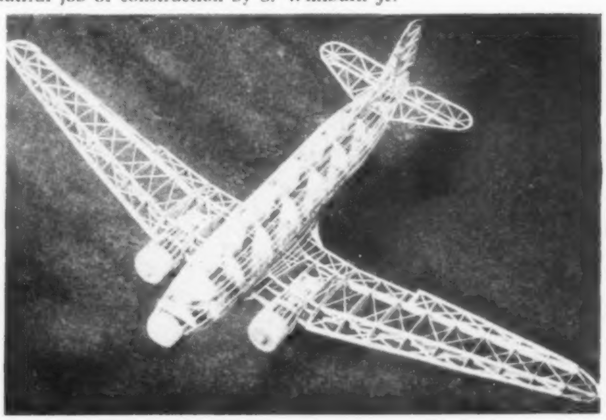
Marion Pierceall of Parsons, Kan., writes and tells us that he is about to join Uncle Sam's Navy as a V5 Aviation Cadet, so his name appears on our Honor Roll. There are many others who will be listed next month.

During the past year less interest has been shown in building contest models and greater interest in scale models. These have not been confined to World War II planes. Richard R. Enos of 338¼ N. Avenue 52, Los Angeles, is one of those who has found many things of interest in World War I ships. He sends us picture 1 of his true scale SE-5 gas model with a 40" wingspan. He has carried out all the details indicated by photographs of this famous old ship. It is a fine flier and in the air gives a most realistic and startling ap-

(Continued on page 34)

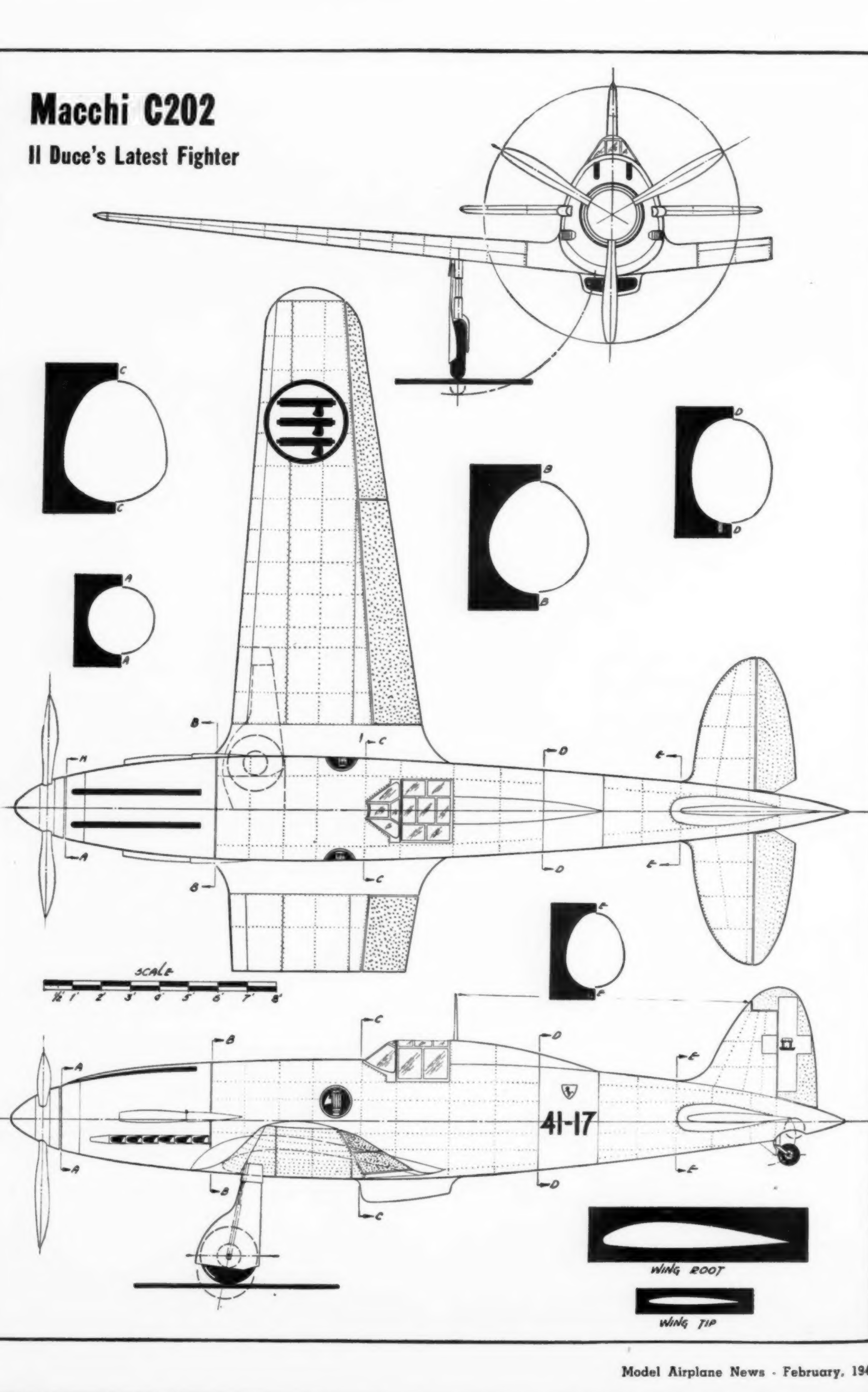
9. This snappy U-control scale Bell Airacobra gives thrilling flights. *Below* 10. Making a model German bomber for portraying crashes in British "movies"

Below-left 11. Dudley Taras fills his gas tank quickly and easily with an oil can. *Right* 12. This Douglas scale model displays a beautiful job of construction by S. Winiburn Jr.



Macchi C202

Il Duce's Latest Fighter



An Italian Macchi 202 with a German engine, shot down by South Africans on the Egyptian Desert. (A rare picture)

FASCIST FOIL

The plane on the cover

THE Italian aviation industry can rightfully trace its ancestry back to antiquity for, although there was no Italy, as such, at the time, Leonardo da Vinci conceived a flying machine and published drawings of several mechanisms designed for flight as early as 1513. Several Italian aircraft firms were in operation by 1910 and Italy actually had a larger air force at the outbreak of World War I than did England, possessing 25 "squadrille" in Italy and 3 in Africa—about 200 machines in all. Italy played a considerable part in the air fighting of World War I and such fighters as Major Baracca, the Italian Ace of Aces; Lieutenant Silvio Scaroni, who shot down 26 planes and Captain Ercole, youthful bomber pilot from Naples, were developed. The giant Caproni bomber was one of the most efficient in use at the time and quantities were produced in the United States by the Standard Aero Corporation and the Fisher Body works. It was during the first World War that the Italian airman's passion for record-breaking was born. In June 1916 Lieutenant Antoine Marchal of France held the world's non-stop long-distance flight record of 807 miles but on August 29th, 1917, Captain Gulio Laureati, of the Italian Air Force, broke this record with a flight from Turin, Italy to Naples and return—total distance of 920 miles. On June 13th, 1918, two Italian aviators flew from their lines to Friedrichshaven, Germany, and back, a distance of 500 miles non-stop, returning with many valuable photographs of this giant Zeppelin base. The world's altitude record was broken on December 14th, 1917 by Lieutenant Papa of the Italian Air Force, with a flight over Turin to 23,000 feet in a Sia-Fiat two-seat biplane in a time of 1 hour, 3 minutes.

One of the outstanding aeronautical achievements of all times was the flight of 24 Savoia-Marchetti S-55 seaplanes from Orbetello Bay to Chicago. Under the command of the late, great General Italo Balbo, the huge ships crossed 6,100 miles of water to land in perfect formation as Italy's contribution to the 1933 Chicago World's Fair.

That Italian airplane and engine design has not only kept abreast of the world's great flying nations but often has forged ahead, can be gleaned from an examination of Italian World's Records held at the outbreak of the second World War in September, 1939: Distance in a Closed Circuit; Angelo Tondi, Roberto Dagasso and Ferrucio Vignoli in a Savoia-Marchetti S-82, 8,033 miles; Distance in a Closed Circuit (seaplanes): Mario Stoppani and Carlo Tonini in a Cant Z-506 seaplane, 3,230 miles; Seaplane Speed Record: Lieutenant Francesco Agello in a Macchi-Castoldi 72 racing seaplane at a speed of 440.67 mph: Seaplane Speed Record over 100 kilometer course: Guglielmo Cassinelli in Macchi-Castoldi 72 racing seaplane at a speed of 390 mph; World's Landplane Altitude Record: Lt.-Colonel Mario Pezzi in a Caproni biplane to a height of 56,032 feet and the World's Landplane Speed Record over a 1,000 kilometer course with a load of 1,000 kilograms: Ing. Furio Niclot in a Breda 88 at a speed of 325 miles per hour. Thus exactly 50% of the recognized world's aircraft records are held by the Italians, an impressive performance particularly when the United States, England and Germany each hold only 16-2/3% of the total.

Italy's declaration of war on June 10th, 1940 found the Regia Aeronautica (Royal Italian Air Force) well equipped and well manned for the type of warfare the participants foresaw at the time. Particularly was the Air Transport Force adequately equipped with estimates of as high as 3,000 heavy transports in service, which were also doing duty as medium bombers. Several ultra highspeed attack

(Continued on page 42)

AMAZING AEROFACTS

by A. V. ASHUN

DID YOU KNOW THAT:

1. A modern airliner is so delicately balanced that the pilot feels the trim of the ship change as the stewardess or a passenger walks the length of the cabin?

2. In the first year of air mail in the United States (1918 between Washington and New York City) a total of 7,720,840 letters were carried?

3. Roscoe Turner's old "Miss Champion" racing plane had a top speed of 375 m.p.h. and he often reached this speed during the Thompson Trophy races although he never revealed this fact until the National Air Races were discontinued a short time ago?

4. The first parachute jump was made in 1783 by the Frenchman Lenormand? He designed it as a means of escape from burning buildings? A. J. Garnerin first used it in connection with aeronautics that same year by jumping from a balloon?

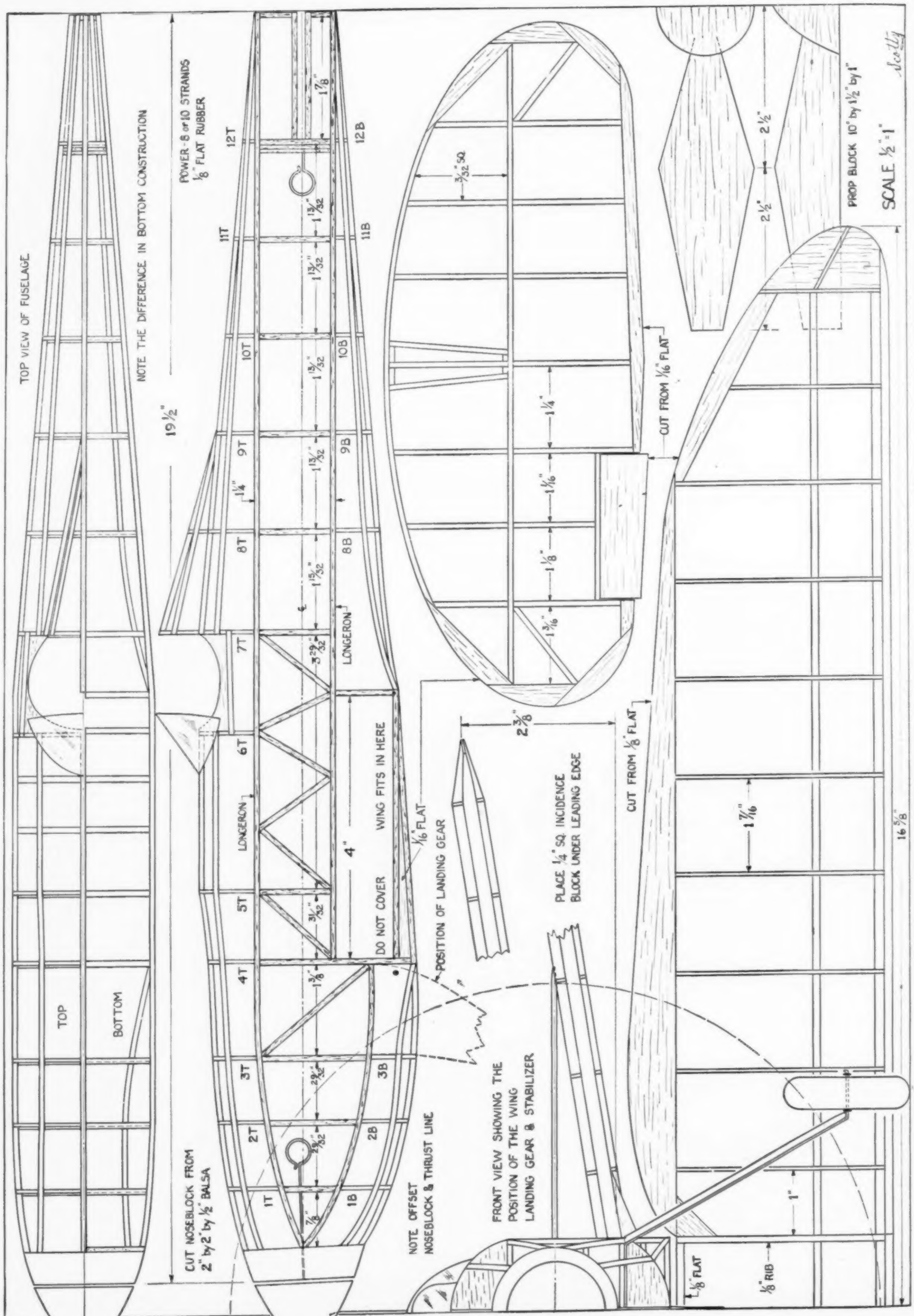
5. Lt. John A. MacReady reached an altitude of 40,800 feet on Sept. 23rd, 1921? It has taken more than twenty years for service-type pursuit planes to reach that altitude?

6. A modern exhaust driven turbine supercharger revolves at speeds as high as 35,000 r.p.m.? This speed is roughly 1300 m.p.h.?

7. The ill-fated British dirigible R-38, largest of its time which crashed on a trial run in England on August 24, 1921, was built for the United States Navy?

8. Jimmie Wedell, pioneer air racing pilot, designer and builder of the famous Wedell-Williams speedsters and once

(Continued on page 44)



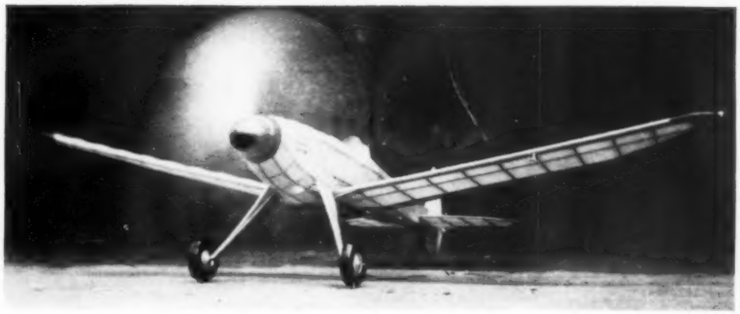
TOP VIEW OF FUSELAGE
NOTE THE DIFFERENCE IN BOTTOM CONSTRUCTION
POWER-8 or 10 STRANDS 1/8" FLAT RUBBER
19 1/2"
TOP
BOTTOM
CUT NOSEBLOCK FROM 2" by 2" by 1/2" BALSA
NOTE OFFSET NOSEBLOCK & THRUST LINE
1T
2T
3T
4T
5T
6T
7T
8T
9T
10T
11T
12T
1B
2B
3B
8B
9B
10B
11B
12B
LONGERON
LONGERON
WING FITS IN HERE
DO NOT COVER
4"
1/16" FLAT
POSITION OF LANDING GEAR
FRONT VIEW SHOWING THE POSITION OF THE WING LANDING GEAR & STABILIZER
PLACE 1/4" SQ. INCIDENCE BLOCK UNDER LEADING EDGE
2 3/8"
CUT FROM 1/8" FLAT
CUT FROM 1/16" FLAT
3/32" SQ.
1 1/4"
1 1/16"
1 1/8"
1 3/16"
1 7/16"
1"
1/8" RIB
1/8" FLAT
16 5/8"
2 1/2"
2 1/2"
PROP BLOCK 10" by 1 1/2" by 1"
SCALE 1/2" = 1"
Scotty

BUILDING THE FLYING SCOT

A sturdy high performance semi-scale low-wing model that is easy to build and fly

by

"SCOTTY" MAYORS



The finished model ready for a takeoff

ONE OF the customary weaknesses of a flying scale model is its lack of flight duration. In order to hold it to scale proportions the motor length must be shorter than on contest ships or on models flown for sport.

Many builders prefer longer flights with models which resemble actual planes but which give more thrilling performance. The Flying Scot is this type: the proportions approximate the number of real planes flying on the battlefronts.

However, performance has been increased by a broad, high aspect-ratio wing and a longer fuselage and motor. It is easier to operate than a scale model and will stand more abuse; you will note that the landing gear is well forward giving unusual protection for the propeller in the event of rough landings. The wing is attached flexibly and is thereby able to absorb shocks more readily, without breakage. It is also adjustable.

Unlike many low-wings, this little ship is an excellent flier. Large wing dihedral is partially responsible for this, which has the effect of raising the center of lift on a line with the thrust line. Ample tail surface also amplifies longitudinal stability.

Directional stability is excellent, the model tending to fly in extremely large right-hand circles (counter-torque). When banking, the turn is quite flat, with little stalling or spinning tendencies, or any indication of spiral instability.

In order to work from full size plans, it will be necessary to double the plate containing fuselage, wing, front, stabilizer and propeller drawings. Everything else is shown full scale, including measurements on the half scale page. Dividers can best be utilized to enlarge the drawings.

Two sides are constructed of 3/32" sq. balsa as shown by the partly filled-in outline. Notice the main longerons run parallel to each other from the leading edge of the wing box back to the tail. Connect the two sides with 3/32" sq. crosspieces as shown in the top view. Don't forget the crosspieces between the two sides at the bottom of the wing box, and the 1/16" flat filler at the bottom. All the formers are cut from a piece of balsa 1/16" by 3" by 12". They are numbered and glued onto the boxlike structure as shown in the fuselage side view. Each former is to the right of its respective number.

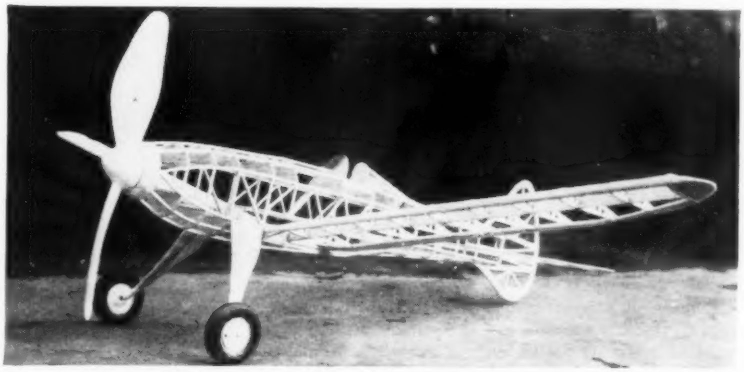
Having cut the noseblock from a block of balsa 2" by 2" by 1/2", it is advisable to glue it lightly to the front end of the structure before attaching stringers. In connection with the nose plug, any size hardwood plug may be used, provided, of course, that the inside hole in the nose block is cut to the plug's diameter. Very little of the plug should project, in order to keep a minimum of space between the prop spinner and the nose block.

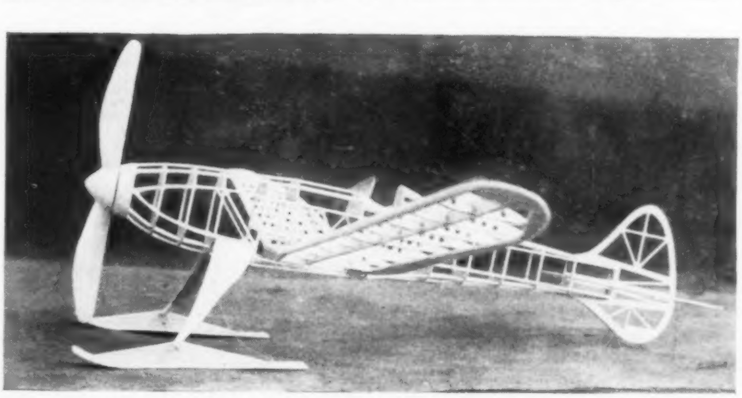
Stringers of 3/32" sq. are now glued into notches cut in the formers. Where the wood curves sharply it is advisable to soak the wood before bending. It is of utmost importance in attaching the stringers to the nose block to tilt it downwards about 1/8" in order to provide downthrust. No side thrust is necessary.

Cut the cockpit outline and glue into place between formers numbers 6 and 7. Before progressing any further sandpaper the fuselage structure, using a fine grade of paper. This will eliminate rough and uneven edges that might mar and tear the covering, or raise unsightly bumps or ridges.

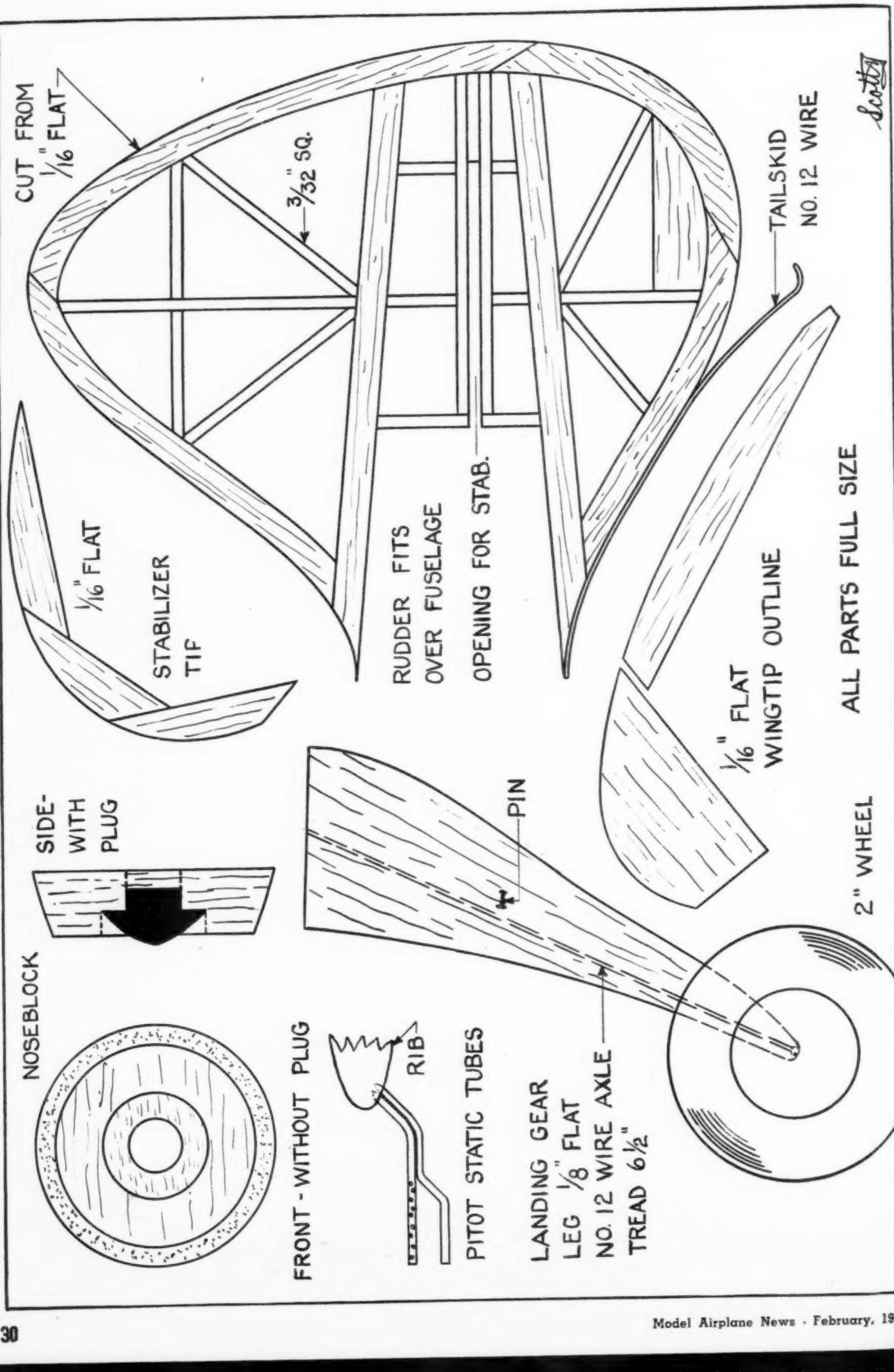
Two pieces of 1/16" flat balsa cross-grained are cut to shape and glued into position to receive the rear hook. An abundance of glue should be smeared

(Continued on page 50)

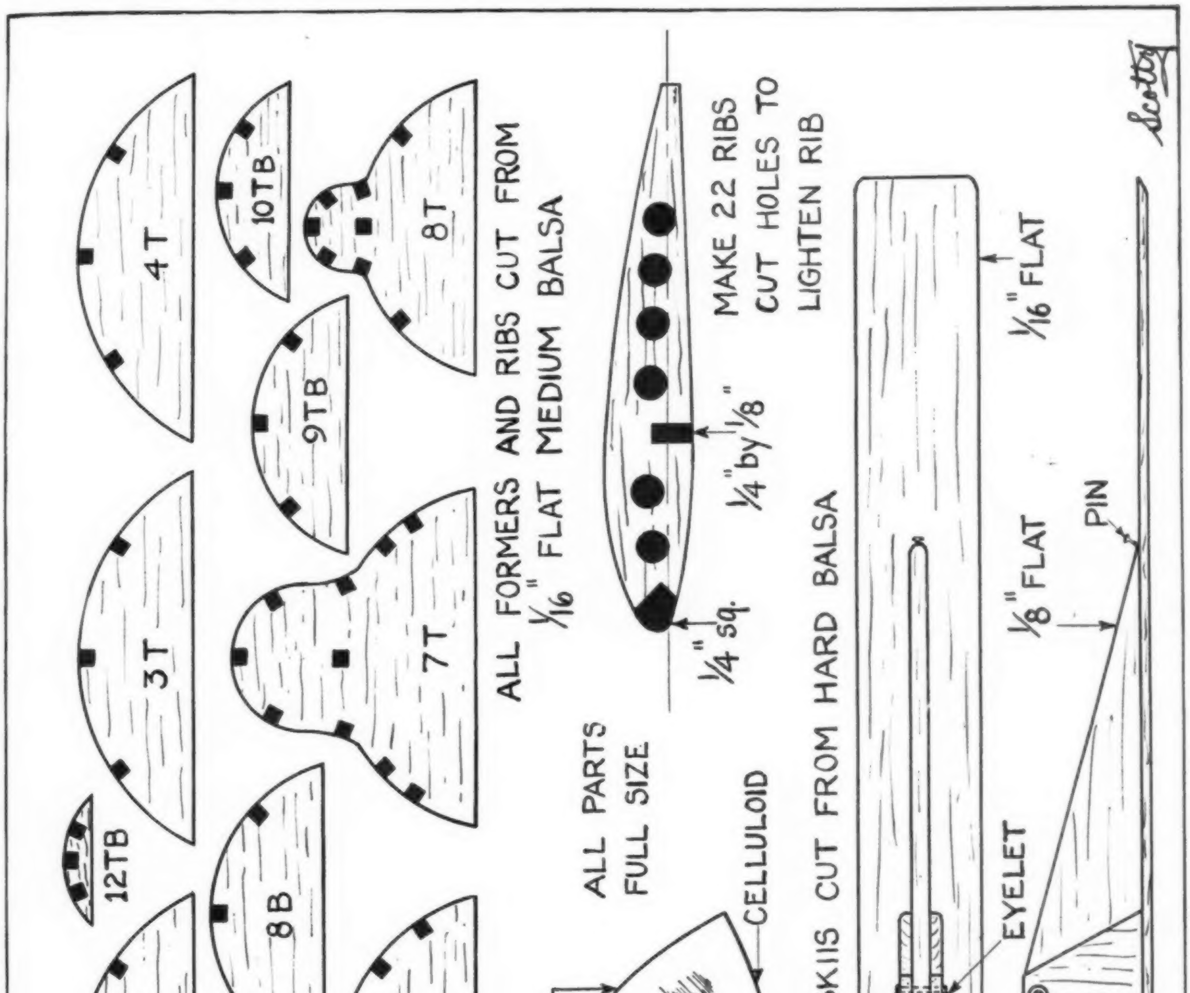




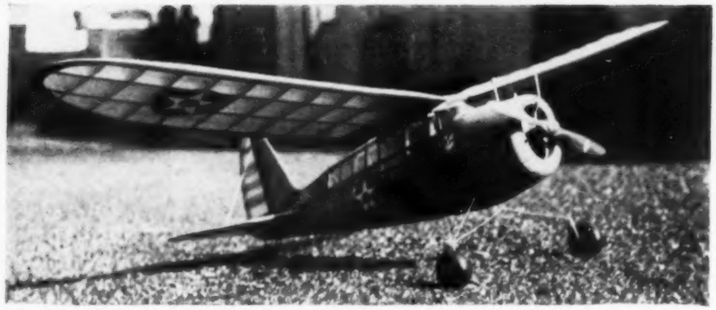
Upper Left: The framework complete ready for covering. *Left:* Skis replace wheels in snowy weather



CUT FROM 1/16" FLAT
3/32" SQ.
TAILSKID NO. 12 WIRE
Scotty
1/16" FLAT
STABILIZER TIP
RUDDER FITS OVER FUSELAGE
OPENING FOR STAB.
1/16" FLAT WINGTIP OUTLINE
ALL PARTS FULL SIZE
NOSEBLOCK
SIDE-WITH PLUG
FRONT - WITHOUT PLUG
RIB
PITOT STATIC TUBES
PIN
LANDING GEAR
LEG 1/8" FLAT
NO. 12 WIRE AXLE
TREAD 6½"
2" WHEEL


1TB
2TB
3B
3T
4T
5T
6T
7T
8B
8T
9TB
10TB
11TB
12TB
ALL FORMERS AND RIBS CUT FROM 1/16" FLAT MEDIUM BALSA
1/4" sq.
1/4" by 1/8
MAKE 22 RIBS
CUT HOLES TO
LIGHTEN RIB
ALL PARTS
FULL SIZE
WINDSHIELD
CELLULOID
COCKPIT
OUTLINE
CUT FROM
1/32" FLAT
SKIIS CUT FROM HARD BALSA
EYELET
1/16" FLAT
1/8" FLAT
PIN
1/16" FLAT
SKI
BEND
Scotty


"1600 Hours of Instructional Traini
and the aid that models give in showing elementary
writes C.S.R., Instruct
New Catalog
Finest Model Airplane Catalog ever published. Large beautiful action display shots. The complete C-D Line. (None free)
Only 5c
Brewster "BUFFALO"
Highly maneuverable and fast. Climbs 4,000 ft. per min. Speeds around 350 m.p.h. Nicknamed "Peanut Special." Model Span 26¼". C-D Master Kit SF-87 $3.00
Douglas SBD "DAUNTLESS"
The famous carrier dive bomber or scout widely employed by the U.S. Navy and Marine Corps. Known as the A-24 in the Army. World's hardest hitting dive bomber. Span 30⅝". C-D Master Kity SF-89 $3.50
★ ★ ★ A Real Victory Hobby! ★ ★ ★
Building C-D models is more than just an exciting hobby wherein pre-flight aviation fundamentals of aerodynamics, plane structure, and design identification unfold themselves—it's a most fascinating way of enjoying your spare time to the utmost, and at the same time making possible savings that may very profitably be used for purchasing war stamps and bonds. With gasoline rationing giving America more time to spend at home, no other hobby can so interestingly fill so many spare hours at so little expense, as the building of C-D models. Invest in War Savings Stamps or War Bonds—with the pastime money you save by building C-D models!
Lockheed "HUDSON" Bomber
Widely used by crack pilots of Allied Nations in many theatres of war. More "Hudsons" ferried overseas than any other plane. Affectionately called "Old Boomerang" by the British it somehow always comes back. Used not only for bombing, but for naissance as well. Just as the prototype has proved itself an outstanding "all-out" war—the 49¾" C-D authentic model has proved a leader in the Cleveland line. It's a "must" model among real air-minded modelers coast to coast. C-D Master Kit SF-95
★ Read These ★ Letters from "Men in the Air Forces"
★ ★ ★
"I found the course for Aviation Mechanics comparatively simple when going through the Navy Trade School because of my years of modelbuilding." F.B.B., N.A.S., Corpus Christi, Tex.
★ ★ ★
"Have been a modelbuilder for a number of years, and have realized the value I have received from it—in my pre-flight, primary, basic and now advanced training in pursuit flying." W.C.K., A.A.F., Victoria, Tex.
★ ★ ★
"Been building models for some years prior to my enlistment as a Wireless Operator/Air Gunner with the RCAF. The educational foundation thus gained is now 'paying off in gold,' for to graduate as an Air Gunner the student must pass a severe test in Aircraft Recognition, and obtain a grade of at least 90%." E.C.W., R.C.A.F., Winnipeg, Can.
★ ★ ★
"We are the guys that repair and keep flying the Air Forces planes. Two years ago when I came to this Air Depot, I had no experience on airplanes to speak of, but thanks to my many years modelbuilding I soon found the work was easily learned. The main difference was instead of 'scale', it was 'full size'." D.B.F., Sacramento, Calif.
★ ★ ★
"I am studying to be a mechanic at the Army Air Force Technical School and my model building experience has helped me immeasurably in recognizing parts of planes, their special features, assembly of planes and where to look for 'trouble spots' when making 25, 50 and 100 hour inspections." A.D.P., A.A.F., Amarillo Field, Tex.
Prize-Winning Gas Models
Kits Complete Except Motors
PLAYBOY SR. Class C Gas. Huge 80" span. Breaking records everywhere. 800 sq. in. Kit GP-5017 (except motor unit) $4.95
PLAYBOY JR. Class B Gas. Span 54½" (360 sq. in.) Kit GP-5006 (e.m.u.) $2.95
BABY PLAYBOY Class A Gas. Span 33". Biggest gas value on market. Kit GP-5008 (e.m.u.) $1.00
Vought-Sikorsky "CORSAIR"
A Navy fighter in the 500 m.p.h. class. Span 30 3/16". C-D Master Kit SF-79 $3.50
Nazi DIVE BOMBER JUNKERS JU-87 STUKA
One of Nazis' greatest weapons for terrorizing and wreaking heavy destruction upon Europe. Span is 34". C-D Master Kit SF-84 $3.50
BIGGEST $1.00 PLANE IN U.S.
$1.50 FAMOUS Wa
All Victory models are extreme for their giant size. Biggest ket. All Kits are complete.
T91-"Mustang"
T77-"Warhawk"
T74-Messer
T78-Hurricane
T85-Lock-
GIANT 82½" GAS MODEL
STINSON RELIANT
2" scale. America's most popular radio-controlled design. Builds up and flies like real plane. Kit GP-66 $12.50
Huge 7 Ft. CONDOR Soarer
You can't get a better design for learning principles of advanced soaring flight. Kit VE-5019 $1.00
★ ★ ★ ORDERIN
If your dealer can't supply you risk. Minimum order $1.00. 10%. Foreign and Overseas ments to Master Kits (up to in length, so please order U. S., we advise against using delays because of parcel size For P.P. Special Delivery in U. S. tax.) All kit contents and prices The usual C-D "Ligtning
Cleveland Model
World's Largest Manufacture
4508C20 Lorain Ave.
When You Build CLEVELAND
that Pilots, Bombardiers, Instructors, Cadets-in-Trainin



13. K. C. Emmit's gas powered Curtiss 0-52 that flies like a contest job

Air Way

(Continued from page 25)

pearance. Mr. Enos has been building planes for the past 10 years and is now employed at Vega Aircraft, Burbank.

Harry Durant of 1031 N. Lamer St., Burbank, has not let scarcity of materials, especially balsa, retard his model activities; he has merely substituted hardwood for balsa in constructing the model shown in picture 2. It is a swell looking job with the unusual feature of a dihedral stabilizer; thus the stabilizer acts as both fin and stabilizer. Mr. Durant is shown holding the model just in case it should be inclined to soar on some stray breeze. The span is 72"; length, 50"; weight, 8 oz. per sq. ft., in spite of the fact that the frame, including ribs, is made of white pine. The ship can "take it," for while glide-tested it stalled at a height of 15 ft., landing on the propeller and wings. The only result was a loose undercarriage. Mr. Durant is flight mechanic at Vega Aircraft. He has a few comments on the new rules:

"I do not like the new rules. A plane in the C Class will have to be too large for comfort and will be subjected to too many crackups; cut the engine time or use spoilers, but keep the weight as is. I know, for I have been building models for 28 years—all originals with weights up to 18 oz. per sq. ft. The high wing loadings make the models 'too hot.' For instance, my little pusher which I recently built weighs 11 oz. per sq. ft. or 34 oz. total. This plane flies well but lands at about 30 mph., so I had to add flaps to slow it down, and still it is high."

We quite agree with Mr. Durant. If you do not wish many crackups the wing loading should be kept low. Using a loading of 8 oz. per sq. ft. and a high lift wing section, landing speeds as low as 15 mph can be obtained. The impact of any airplane with the ground varies as the square of the speed. The formula for impact is MV^2. Here M is the weight or mass of the airplane. V is the speed. At 15 mph a plane will have just ¼ the impact as a plane of the same weight landing at 30 mph.

Picture 3 shows a model built by Frank S. Gue of 10508 71 Avenue, Edmonton, Alta., Canada. Believe it or not, it conforms to Wakefield specifications. It is most unique; the main wing having both dihedral and extreme sweepback. Mr. Gue says:

"The wings are swept back to a degree found usually only in tailless models, and like these models sports tip rudders. It has also a conventional tail unit, the rudders however being a bit smaller than usually required. The extreme forward placement of the wing is occasioned by the lifting fuselage, which has a center of lift of its own back of the wing.

"It was designed for super-stability and lives up to all expectations. It seems incapable of stalling and never, during hundreds of flights, has cracked up as a result of assuming a dangerous flight attitude.

"The plane is powered with 2 motors, each of 19 strands of 3/16" rubber. These are geared to a single 19" one-blade flush-folding propeller of metal and wood. With this it weighs a total of 11½ oz. and still flies too slowly to be conveniently sent up in a wind, because of its excessive drift. Though not designed for hardwood construction, it would meet beautifully such requirements."

Mr. Gue attributes its fine performance to the extra lift of the fuselage, the area of this being 150 sq. in.

Picture 4 shows some enthusiastic U-control fliers in Los Angeles, guiding their steeds along at 65-70 mph. Free flights are prohibited in many districts so model builders have turned to U-control flights. These little ships are attached to one end of one or two wires which are held at the other end by the pilot. As the ship takes off it is restrained by the wires, through which the pilot can control the little model by pulling on one or the other when the ship is in the air. Pilots must develop great agility to take off, fly and land their models like a full scale ship.

George Haupt of 591 Moorhead Place, Pittsburgh, sends in his entry for the smallest airplane in existence. It is shown in picture 5. He was prompted to send this to us after he saw a picture of a small air-

14. Theodore Henriques' gas model is only a speck in the sky above Guayaquil, Ecuador


Megow's Victory Construction
... featured in the Newest and Greatest Gas Model the
"Jap-Slapper"
$2.00
Every day new and better methods are being found. Instead of *limiting,* War Requirements are actually *causing* the production of stronger and better things. In model airplanes, Megow's VICTORY CONSTRUCTION reaches a new high in strength with all the lightness of balsawood.
Introduced in the "Jap-Slapper," Megow's newest gas model kit, the new VICTORY CONSTRUCTION, developed exclusively by Megow, features interlocking formers and fully gusseted joints that require only the regular model builders' cement. Many ideas gained in real aircraft production appear in this latest Megow sensation. Designed especially for contest work, the "Jap-Slapper" not only meets the construction problems of the model builder, but advances every opportunity to beat the record.
The "Jap-Slapper's" wingspan is 42 inches, and overall length 32 inches. Wing area, 300 square inches with loading capacity of 9½ ounces per square foot. A class B model, for motors of .20 to .29 displacement, and a ready-to-fly weight of only 20 ounces!
If you build model airplanes, be sure you build NEW types, engineered for today's materials as found in Megow kits. If your dealer cannot supply you, order direct from us.
A FEW FEATURES OF VICTORY CONSTRUCTION
Sectional View
FLIGHT TIMER
LANDING GEAR
Wing Rib
Fuselage Section
Gussets
JOINT
Lap Joint
Megow
The fact that a large part of the Megow plant is now engaged in war production is not seriously curtailing the production of regular lines, and new models, meeting the demands of today both in types and in construction, are constantly coming through. Watch for them!
PHILADELPHIA, PENNSYLVANIA

plane in "Air Ways" that claimed to be the smallest in the world. He does not wish to be out-done. He writes:

"I have wanted to send in a picture of this little model for over 1½ years, but until now no camera I could obtain was capable of taking its pictures. So I finally made one. The pictures are positively not 'faked' and the size of the model can be judged accurately from the matchbox upon which it rests and the tape measure. It is a model Boeing P12-E built to a scale of 1/35" to a foot. The span of the top wing is approximately 1⅛". Small as it is, it sports a real celluloid windshield, real struts and wire."

The war, in spite of its intensity, has not put English aeromodelers out of business, for we hear from Geoffrey D. Pike of 26 Arlington Drive, Mapperly Park, Nottingham, who sends us picture 6. It shows him with one of his latest stick models constructed, more or less, from plans appearing in MODEL AIRPLANE NEWS. Mr. Pike says:

"Although the greatest duration I have had from this ship is only 4:06, it was out of sight and at a terrific height. It was recovered however and has since made 9 flights of over 3 min., and is still in perfect condition."

Mr. Pike also tells us that modelers in England have turned to rubber powered ships because of the ban placed on gas powered ships until after the war. He has been a model builder for nearly 6 years.

Those modelers who have tried to take flight pictures of their planes will appreciate picture 7. This is a real flight picture of a Boeing F4B4 built by Stephan Filchak of 114 Walnut St., Plymouth, Pa. We regret that he does not send us more information concerning the model, as evidently it is an excellent flier.

Picture 8 shows a Boeing scale model built by Stan Staples of 220 Broadway, Chico, Cal. It is certainly a beautiful and most realistic job. The details shown in the picture will say more than any words we can print.

Mr. Joseph Brichacek of 5104 Barkwill Ave., Cleveland, is a tool designer and works about 10 hours a day, but, he says:

"I find time to relax by building models. I have finished 7 scale models that were given to the Army and Navy and also have just finished a guide-line 1"-scale gas powered Bell P-39."

The plane is shown in picture 9 and is a most realistic looking job. The motor, like the large plane, is mounted over the center of the wing and drives the propeller through a long shaft. The forward upper half of the body may be detached so that the powerplant can be easily adjusted or fuel tank refilled.

Scale models are used in "shots" of crashing and blazing aircraft that appear in British motion pictures about the Royal Air Force. The man who makes these models is Mr. V. J. G. Woodason. He started it as a hobby and now has continued as an important war work. His factory is an old farmhouse and he has 14 skilled craftsmen working for him. All models are carefully detailed, and besides being used in motion pictures are used for aircraft recognition by the R.A.F. and other services. Picture 10 shows one of the workmen busily engaged in putting finishing touches on a model German bomber.

Picture 11 shows Dudley Taras at a recent contest refueling his originally designed model with an oil can. He has found this to be the easiest way to get fuel into his tank without slopping and spilling it all over the cowl and other parts of the ship. If you do not already use an oil can for this purpose get one and try it out at your next contest!

Apparently some people are born with more patience than others. This is forcibly impressed upon one when looking at picture 12, for here you see a 32" Douglas scale model before covering has been applied. It was built by Slack Winburn Jr. of 1801 S. 15th E., Salt Lake City, who required many hours of work to assemble the plane's delicate structure. Practice in building such models is not time wasted, by any means; for during the past few years such work has provided many modelers who now are using their knowledge to produce Uncle Sam's tremendous air fleet.

Kenneth C. Emmit sends us picture 13, showing his Curtiss 0-52 built recently from plans in MODEL AIRPLANE NEWS. He says:

"It is a remarkable flier and flights of over 5 min. have been obtained on a 30 sec. engine run."

This illustrates an interesting point: scale gas models can be made to fly just as well as unorthodox, specially built contest gas jobs. Why build these freakish looking jobs when you can "kill two birds with one stone"? That is, have a real scale model and an excellent flier.

Theodore V. Henriques writes us from Guayaquil, Ecuador, P.O. Box 1094. He has been getting MODEL AIRPLANE NEWS regularly and through its pages has kept in active contact with the model world. He says:

"Last week I took several pictures of one of my gas jobs, a Red Zephyr built a couple of years ago. The picture, 14, was taken at the airport in Quito, which is at an altitude of over 9000 ft. As you can see the plane is performing quite well, though the engine could not develop the full rpm's due to the low air density at this high altitude."

Because of its altitude and distance from the camera the plane appears very small in the picture; nevertheless we can assure you that it is really a gas job, as Mr. Henriques states. He continues:

"The main reason for lack of interest in model planes here has been due to the fact that practically everything one needs for building has to be ordered from the States and requires a lot of 'red tape' and time. The only thing we have plenty of is balsa wood, this country producing many thousands of feet of it."

Contest and Club News

Alabama

The 2nd annual North Alabama model airplane contest was held at the Model Airport, Muscle Shoals City, on Oct. 18th. The 51 contestants, with their 200 planes and gliders, came from within a radius of 150 miles to begin flying at 9 A.M. The Muscle Shoals Modelers won the Florence Jr. Chamber of Commerce Trophy from the Nashville Aero Bugs, who have held it for the past year. This year the Modelers scored 44 points while the Aero Bugs scored

24. Kenneth Brown, Nashville, won first prize for the day for the longest gas model flight of the day: 12:48. It then flew out of sight but was recovered 16 miles south of the flying field. Other long flights included those of James Satterfield, Nashville, 9:34; Raymond Robinson, Birmingham, 7:7; C. H. Young, TVA, 6:44; Joe Porter, Fayetteville, Tenn., 6:20. Bruce Perry, Nashville, sent his 6 oz. rubber powered job out of sight after 4:34. The plane was never located. A number of other ships also were lost.

An interesting feature of the contest was the grab-bag prize; this was for boys who did not win or place in any of the events. They were permitted to draw a prize from the grab bag. This idea was a surprise to the boys and they were thrilled at winning something.

Picture 15 shows some of the winners: Left to right they are: Chester Young, MSM treasurer, winner of Class A Sr.; Dr. C. William Taylor, MSM vice-pres. and contest director; Carroll Rickard, MSM president and winner of Class B Sr.; Norman Coker, MSM Secretary and winner of Class C Sr.

California

Joseph Manezes of Hanford, a member of the Fresno Gas Model Assn., recently created quite a stir on the West Coast when he took capital prizes in two classes, A and C, at the contest sponsored by the East Bay Aeroneers of Oakland. He also placed 5th in Class B.

Famous modelers from all parts of the Coast were on hand and they all seemed to enjoy the contest, especially because they visited among one another and had a chance to "swap" ideas; it was a real friendly reunion among the various clubs. Contest results were:

Class A	*Time*
Joe Menezes	888 Sec.
Roy Gruenwald	254 "
Bill Winter	236 "
Russ Basye	235 "
Paul Kamm	215 "

Class B	*Time*
Bill Dunham	963 Sec.
Arle Armstrong	931 "
Dutch Van Tassel	837 "
Milton Taylor	627 "
Bud Romak	626 "

Class C	*Time*
Joe Menezes	1502 Sec.
Red James	1365 "
Ted Dice	1102 "
John Tatone	847 "
Bill Condie	731 "

Notices

Eric E. Ericson, one of our old-time modelers, now is located at 228 Summer Street, Buffalo, N.Y. He writes and says he is extremely interested in forming a model building club there. We suggest that all modelers—indoor, outdoor, rubber and gas—who have a "yen" for some competition communicate with Mr. Ericson.

Earle F. Gilbert of 62 Windsor Road, Oradell, N.J., tells us that the Windsor Model Airplane Club has recently been formed in this city. Officers are: Dick Terhune, president; Earle Gilbert, vice-pres. and secretary; Joan Able, treasurer. Regular meetings are held and those who wish to join should contact Mr. Gilbert.

Shem Schultz Jr. of 288 S. Saratoga, St. Paul, Minn., is a keen aeromodeling fan but he has been ill and confined to bed. He is especially interested in gas model helicopters and ornithopters, and would like to correspond with someone who has done some work along these lines. If anyone has had any experience with this type of model craft don't fail to write Schultz; he would appreciate it.

J. M. Flaherty of 30 Park Avenue, Chadderton nr. Oldham, Lanc., England writes:

"I will be very pleased if you could put me in touch with a correspondent in Canada whose hobby is model aircraft."

Here is a chance for Canadian readers to write Flaherty! He is a member of the Air Training Corps, builds solid and duration models, and has almost completed his first gas job—a KGS—built from scale plans in MODEL AIRPLANE NEWS.

English boys have a tough time now with their model flying; being so close to the sphere of activities they go out to the model fields with their model in one hand and holding their hat with the other to save it from being blown off by bombs. Of course gas models are taboo. We are sure that if some Canadian or American boys will write to Flaherty he will be able to return interesting information about British model aviation.

Hints and Comments

Robert H. Pfalz of Columbus, Miss., General Delivery, sends a useful hint which we pass on to other modelers:

"When building a model airplane, particularly the fuselage, I have found that when placing one side on top of the other when assembling they can be prevented from sticking together by putting small pieces of scotch-tape underneath the joints to be glued. After gluing merely lift them apart and remove the tape.

Daniel C. Mintfield of 2413 P Street, Lincoln, Nebr., writes us some helpful information on hardwood:

"I have been interested in aircraft, large and small, since I saw my first in '17. I am only 54 now and have begun to dream about the flying wing already.

"But I am most concerned about the fact that we are to be divorced from balsa. Before I ever heard of gliders I used to cut wood for fuel, as well as being quite familiar with lumber, so if you will permit me I should like to name 5 possible substitutes: the sapwoods of white pine, white willow, cottonwood, cedar and poplar.

"I was surprised several years before the Half World War to note how light seasoned willow was even when only air-dried. I am a native of Wisconsin and I have seen willow trees 18" diameter at the stump. However we need to keep in mind that the larger the tree, the thinner the sapwood, the part best suited for our purpose.

"The needs of modelers require wood low in the crystalline substances, lignin, sugars, pitches and gumes, since these increase weight and other annoyances. When possible such wood should be quarter-sawed and carefully kiln-dried. There must be other suitable woods but I have named only

those familiar to me, and suitable spars are uppermost in mind.

"I am wondering about the Florida palmetto. Has anyone tried it? If anyone cares to write to the U.S. Forest Produx Laboratory, Madison, Wisc., additional information will be available.

"We may be compelled to build glider models from weedstalx, we may have to build spars of splinters, or feathers from turkey buzzards, but if an insect without brains can ride the air, are we going to be licked for lack of an imported wood? Man with his academic education and his politix!

"Speed the day when we shall build gliders of a thermoplastic, fill the wings with imprisoned helium and ride the air all day!

"I can divulge my plan for using weedstalx for spars, later, if any of your readers give a care."

Dick Diehl of 1449 Morin, Albany, Cal., says:

"In answer to your statement in Model Airplane News that if the West Coast modelers didn't like the rules why don't they write? Well, for the third time I am saying that the 1942 rules have received a poor reception on the West Coast especially in concern with gas models."

Another "head-down" feat, for which Sergeant William C. Gribble was cited for a decoration, involved his hanging down through an open hatch and working on the repair of one of the retractable landing gears while his heels were held by two other crew members. Sergeant Gribble worked for nearly one hour in this position but, thanks to his efforts, the gear was repaired and a safe landing was made, saving the lives of seven crew members.

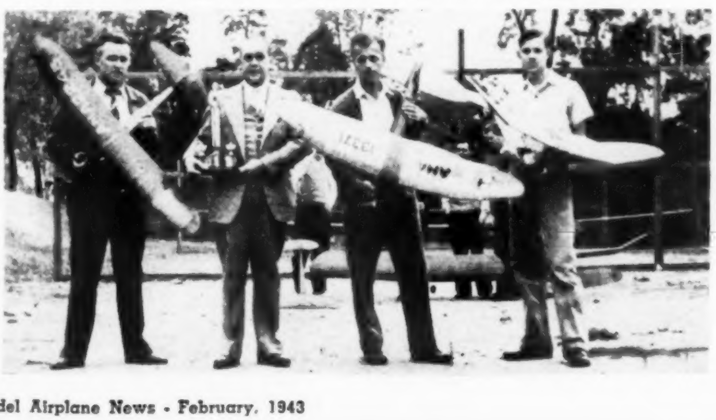
"The way the 1942 rules are stated we would be flying for precision, which I think should be kept with U-control and G-line flying. We agree that models have to be brought down by dethermalizers or some other means so as not to interfere with this country's defense.

"Our views on the rules are: Instead of the 4 min. time, we on the West Coast found through several contests that with a 10 min. limit and not subtracting that over 10 from the 10 min. made the contest more like they used to be and yet a model flying 10 min. could not travel very far or get out of control. In these new rules we would require a dethermalizer to bring the model down in 10 min. In case there is a tie the winner would be decided by a fly-off or the one with the shortest motor run.

"Outdoor flying means a lot to us; California holds the majority of the gas records and yet the A.M.A. Rules Committee didn't seem to take into consideration the West Coast ideas or views.

"Unless something is done to change these rules the West Coast is thinking of breaking away from the A.M.A., flying under these rules and the 1941 rules combined. Several of the larger clubs are

15. Some winners of the 2nd annual Alabama modelplane contest



already taking action towards the new organization."

And Paul Romak of 3422 Jordan Rd., Oakland, says:

"In regard to the revolution on the West Coast:

"I joined the A.M.A. with the thought in mind that all fliers should have a set of equal and just rules to be governed by, and these rules should be the wishes of the majority, not armchair fliers.

"In the first place, no crossection rule; what is to be gained by that? Second, limiting flights to 4 min.; anyone that ever flew knows you have to have a thermal to get 4 min. Then how are you going to get your ship down in that time without effective dethermalizers? Third, hand launching: where is the sporting element in hand launching?

"Their rules are not the wishes of myself and any other flier I have spoken to at numerous contests here on the Pacific Coast. The club I belong to knew there must be some rules to follow so we adopted the 1941 A.M.A. rules with these additions:

"Every ship must have a dethermalizer, no flights over 10 min. but 10 min. recorded for any flight over 10 min., fliers allowed to push or shove ship on takeoff provided he doesn't take a step forward.

"I am proud to say my whole family are fliers: my wife, two sons, brothers and their wives and myself—and we all agree to the above.

"We hope we can very soon straighten out this flying problem to the satisfaction of all model fliers in the good old U.S.A."

MODEL AIRPLANE NEWS would like to hear from anyone who would like silhouette charts of planes for reference in identifying American, British, German, Japanese or Italian planes. State what you would like. If enough inquiries are received charts will be made available at a small charge.

VICTORY

"Pine Needle" Explodes a Myth

(Continued from page 19)

gears may either be used or left off. Most models being built here at Hampton do not have landing gears as they add a lot of drag, and contrary to popular belief, less props are broken than before.

Stabilizer: The stabilizer is a simple thing to construct, simplicity being the spice of pine. There are nevertheless a few tips that are worthwhile to follow as they will stop trouble before it starts. The ribs are cut out alike from 1/32" pine; trailing edge is pretapered stock. This saves a lot of work as the pine would be hard to taper. Tips are cut out rough and cemented together to the leading and trailing edge. They are then shaped to a good curve and sanded. The ribs are then added, also the spars. The two top spars allow the stab to mount firm to the fuselage bottom. A very big advantage is had when the stabilizer is mounted separate from the rudder, in that the rudder adjustment is never changed no matter how the stab gets knocked around, thereby allowing consistent flights. It does not seem to change the model's flights—the stability if anything is improved. A final sanding will finish up the stab.

Wing: When building the wing above all take your time. Try to duplicate the wing as much as possible, for in the wing lies the secret of fine flights. Airfoil is a slightly modified Grant and has given results far above the average. As the model was intended for a fast climb along with a flat glide the airfoil was thinned slightly, this being the only change. Ribs are first cut using tin from a tin can for a template. They are cut out roughly and then doweled together with 1/8" dowel; this will hold them in place while the final shaping takes place. Be very careful while doing this for the exact contour of the ribs must be kept for best results. The tips are cut and cemented in place to the leading and trailing edge. The trailing edge for the wing was also pretapered stock. When this is dry the tips are given their final shaping and ribs cemented in place. You will notice the tip ribs are of different shape than the rest; this is important for it allows the tips to taper smoothly. Also the centersection ribs are flat bottomed. This is to allow the wing to sit solid on the wing platform.

Now spars are added and the dihedral put in. Be careful in cementing and joining the centersection so that there are no butt joints. Allow plenty of cement and put a little work in the splice and it will never break. The leading edge is carefully shaped to fit a template made for the nose contour. The wing is now ready for final sanding with rough and then smooth sandpaper.

Covering: It will be a good idea at this time to carefully go over the entire framework with a good grade of smooth sandpaper to make sure that nothing has been missed. The original model was covered with a good grade of light-weight white bamboo paper. The fuselage is covered with as large sections as possible. Wet the paper while covering near the tail so that wrinkles are avoided. The stab is covered dry with the exception of the tips on top, which are sprayed before covering. The wing is also covered wet at the tip. In wetting this paper at the tip one is able to stretch the paper a reasonable amount, enough to get the wrinkle out. The paper is trimmed by using sandpaper instead of a razor. This may sound silly but in doing this you will get a very smooth job that will not require you to go back and sand the outline to smooth the contour. The entire model is then sprayed and given two thin coats of clear dope. The model may now be colored entirely or just trimmed as shown. By trimming the outline a few ounces of weight is saved, which is a good thing. This covering should be sanded between the first two coats. It is now given a thin final coat of clear dope to put a gloss on the entire ship.

Testing: Testing of a model should be one of almost ritual undertaking. It is very important that several things be checked before even the test glide is taken. One is to make sure the wing and tail line up with the fuselage. One large source of annoyance while flying a model is to

have it turn in the wrong direction, and no matter what you do in turning the rudder or offsetting the thrust will it turn in the right direction. When this happens check the alignment of the wing and tail. If they are not in line block them up until they do. One way of stopping this is to build the ship in good rig.

If the ship persists in circling the wrong way you probably have excessive warps. Most warps can be straightened by doping with thinner and holding it straight until it has thoroughly dried out. Second, the thrust should be a little to the right. This can be determined by a series of test flights. Third, the model should balance at the half-way point on the wing. Fourth, the wiring should be checked to make sure a very hot spark is coming through. Fifth, the timer should be set for about six to eight seconds. Now, providing the motor will run, you are ready.

The model must be glided before any test flights are to be attempted. The original model required no adjustment whatsoever except for the turning of the rudder. So if you follow the plans exactly as shown you will have no trouble. Nevertheless some models will require some adjustment. This is done by varying the incidence of the wing and tail. A smooth flat glide for this ship should travel about 40 to 55 ft. when launched level at gliding speed. Add incidence for a diving ship and decrease for a ship that stalls.

Now, providing the glide is very good, the ship is ready for a test flight. Try launching her into the wind with the motor just above idling and turning over smoothly. The flight should be to the right and the climb very shallow. Adjust the rudder for a left turn in the glide and the motor for a right turn in the climb; the right amount will vary so try a few flights. After this has been obtained try more flights until the ship is climbing in a fast right circle to the right and rolling out like a hand-launched glider into a nice left glide. Above all don't let your ship climb vertically for this will cause you to lose a lot of altitude when the motor quits and that just isn't good. Keep up this testing procedure, master it; it will take some time but in the end you will have a ship that will really win contests. As for sport flying it is plenty thrilling to equip your ship with a pair of floats, set her on the water and watch her take off. Lots of luck and "Start 'Em Flying."

VICTORY

Fascist Foil

(Continued from page 27)

bombers and light fighter bombers were in squadron service (notably the Breda 65 and 88 types and Caproni 135 and 310 models). Official figures estimated the total force as comprising some 7,500 planes of all types. The Italian fighter craft had seen considerable service in the Spanish revolution and large numbers of fighter pilots trained in actual combat were ready for action.

However, although slow to start, World War II combat flying changed considerably from what had been experienced heretofore and by the Fall of 1941 most of Italy's equipment had been very obviously outclassed. Due to incessant demands from Goering, the Regia Aeronautica furnished several squadrons of fighter and bomber craft to the Luftwaffe for use against England, but these ships were dispatched in short order by Spitfires and Hurricanes defending London and only some 20% of the total force was available when it was decided to withdraw them from the combat area.

In the forefront of Italian aviation design since 1912 has been Aeronautica Macchi at Varese whose Chief Engineer, Ing. Comm. Mario Castoldi, has gained an enviable reputation throughout the world's aeronautical circles. After the development of the famed Macchi-Castoldi seaplane racer in 1934, Signor Castoldi continued his interest in highspeed craft and undertook a single-seat fighter the following year to be known as the C.200 "Saetta" (or Lightning). A period of development and improvement followed until the C.200 was capable of a speed of better than 300 mph on an 840 hp. Fiat engine.

After the virtual seizure of the Italian aviation industry by the German High Command in the Spring of 1941, the production of many types of airplane and engines was halted in an attempt at standardization of aviation products throughout Nazi-dominated Europe. Signor Castoldi was directed to incorporate the well-known German Daimler-Benz engine into the Macchi C.200 replacing the Fiat engine upon which production has been halted. The resultant airplane, with many design and contour refinements, has appeared in service both in the African campaign and in Fighter Defense Units in Central and Northern Italy. Known as the C.202, it is a considerable improvement over the parent model.

The wing is all metal, full cantilever design built in three sections, a center section integral with the fuselage and two outer panel sections. Wing leading edge is readily detachable facilitating inspection and maintenance of flight control cables and internal wing structure. The entire wing trailing section is hinged, the outer portion acting differentially as ailerons and the inner portion being hydraulically operated flaps. The ailerons and flaps are interconnected in such a manner that when the flaps are lowered the ailerons are dropped simultaneously, affording a still greater flap area in effect although still providing lateral control.

The fuselage is built in three sections also, main section comprising the wing center section, engine section consisting of engine and accessories and the aft section supporting the tail. Conventional semi-monocoque construction is used with the lower mold line following practically a straight line.

The pilot is fully enclosed in a glass canopy which opens to the starboard and the enclosure is faired into the fuselage by a headrest assembly which terminates along the upper contour about half-way back to the fin.

The empennage is full cantilever design, all metal construction with the elevator and rudder fabric covered. The horizontal stabilizer is adjustable vertically for longitudinal trimming purposes.

Landing gear is conventional type utilizing two main landing gear strut assemblies and a tail wheel unit. The main gear folds inward into recesses provided in the leading edge of the wing just outboard of the fuselage and the tail wheel folds aft up into the tail cone. The main gear is completely enclosed in the retracted position by large fairing plates. All landing gear operating is by hydraulic control from the cockpit with energy derived from a fluid reservoir and engine-driven hydraulic pump.

The C.202 "Saetta II" was originally designed for a Fiat A.74RC radial air-cooled engine and for that reason its main frames are of elliptical crossection tapering to an oval near the firewall. However, for reasons described above, the German Daimler-Benz D.B. 601N 12-cylinder liquid-cooled engine was hastily substituted and, although a remarkable job of installation and cowling was obviously done, the design as a whole has suffered from this change. This engine is an inverted design utilizing a system of direct fuel injection through the use of 12 plunger inline direct injection pumps to supply raw fuel automatically mixed into each cylinder. The engine supercharger is coupled to the crankshaft by a fluid-drive providing an infinite number of gear-ratios. The boost pressure developed by the supercharger operates the injection pumps by servo action, and, since the boost pressure is a function of the altitude density-pressure, the engine is almost automatic in operation. Maximum power developed is 1,270 b.h.p. at 2,600 rpm. at 16,270 feet at a boost pressure of 7.81 pounds per square inch. For takeoff at 2,600 rpm., 1,200 b.h.p. is developed with 7.81 psi boost pressure. The maximum power stated above is permitted for only one minute. This time limit is automatic in that, as the throttle is moved past its takeoff stop, a small fan blade in the slipstream is set in operation which moves a clock mechanism. This latter automatically moves the throttle back to takeoff position at the end of one minute. The engine weighs only 1,450 pounds giving it a 1.20 pounds/b.h.p. figure as compared with the 1.23 pounds/b.h.p. of our Allison engine of comparable displacement and power.

The propeller is a V.D.M. full-feathering constant-speed design, controlled by an independent system, making it possible to feather it without the engine running, a feature not found on American airplanes. The three-bladed propeller weighs 304 pounds.

Air for the engine is taken in through louvres on either side of the cowling and the engine is cooled by water from a radiator mounted directly below the pilot beneath the fuselage similar to our North American Mustang design (Model Airplane News, September 1941 issue). When operating in cold weather the coolwater is mixed 50-50 with glycol for use as an anti-freeze.

Firepower of the C.202 is light indeed in the present age of higher and still higher armament demands, particularly upon fighter-type aircraft. Two 12.7 millimeter machine-guns are mounted along the upper cowling and are synchronized

to fire through the propeller which cuts down the rate of fire materially. Whereas the fire interrupter cam on two-bladed propellers have two lobes permitting two shots each revolution, three-bladed propellers are equipped with only a single lobe reducing the rate-of-fire of the guns considerably. Although only these two guns have been mentioned in official specifications on the C.202, there remains a strong possibility that it also mounts a 20 millimeter cannon firing through the hub for the D.B. 601N engine is fitted with a large diameter clearance throughout its length between the cylinder heads designed for installation of such a weapon firing through the propeller.

The pilot is well protected from enemy gun-fire by two large plates of armour, one beneath his seat pan and one mounted on the rear of the seat-back. In addition, laminated plate bullet-resistant glass panels are provided in the windshield affording splinter protection from the front. This armor is a new development in Italian planes, none having been reported previously.

The Macchi C.202 fighter has a top speed of 330 mph at 18,000 feet placing it far down the list of modern highspeed fighter craft particularly the 400 plus Spitfire and Lockheed Lightning (Model Airplane News, May 1939 issue) which it now faces in the African campaign. It has a cruising speed of 300 mph at 18,000 ft. and a range of some 300 miles which can be increased to 1,000 miles at 180 mph at 15,000 ft. through the addition of droppable belly tanks.

It has a service ceiling of 34,500 feet and one-hour's oxygen supply is carried for the pilot for operation at this altitude. Wing span is 35 ft.; overall length, 20 ft. 5 in. Wing area is 161 square feet, giving a wing loading at a gross weight of 6,300 pounds of 39.1 pounds per square foot, quite high for a ship of its type. This same weight figure gives it a power loading of 5.25 pounds per horsepower.

No definite information as to production status of the C.202 has been released although they have been found on several fronts, small numbers of them having been used in the earlier stages of the North African campaign. Several were shot down virtually intact by British Hurribomber versions of the famed Hurricane and were later re-built, flown and studied by the Royal Air Force. The ship was described as being exceptionally light for its overall dimensions and delicate on the controls. It performed well and was highly maneuverable at speeds around 200 mph. but as power was increased the stick loads became quite high, making it comparatively ineffective in highspeed combat.

However, we may rest assured that even though the C.202 might have been in quantity production, the recent raids of the Royal Air Force Bomber Command on Italian production centers, which all but reduced the major war industries of Italy to a rubble heap, have materially cut down if not halted altogether production on the type.

Build a Model Macchi Fighter

Irrespective of its comparatively poor fighting and performance qualities described in the preceding article, the Macchi C.202 is, nevertheless, one of the most beautiful fighter ships now in action and its lines can easily be copied into a faithful scale model. Select a good grade of balsa sheet and trace the wing planform. Cut this out with a bandsaw, taking particular care to give the correct contour to the wing tips. With a coarse grade of sandpaper, sand down the wing to an accurate airfoil section applying the root and tip crossectional templates for accurate measurements.

Cut the fuselage from a single block of Balsa and trace the side view, cutting this out with a bandsaw. Now trace the top view and repeat the process. Carve the block down to a rough, oval section and, with a rough grade of sandpaper, sand it to an approximate contour. Cut out the silhouette templates and apply them at the points shown on the drawings. With a fine grade of sandpaper sand the fuselage and wing to an accurate section and contour and spray with a light green paint.

Cut the tail surfaces following the directions given above for the wing, sand and paint them light green. Assemble the parts with cement and fill in the fairing with cement mixed with fine sawdust. The landing gear may be built up with bamboo struts and sheet balsa fairing panels. After final assembly, spray another coat of light green paint and apply the insignias as shown. After completion, spray the entire assembly with a coat of clear lacquer, continuing until a fine, high gloss is reflected.

With a little pains, details of the engine exhaust stacks, water radiator and enclosure can be faithfully reproduced and certainly the beautiful lines of the Macchi C.202 fighter is worthy of extra hours of work.

VICTORY

Amazing Aerofacts

(Continued from page 27)

holder of the world's landplane speed record (305 m.p.h.), after braving death hundreds of times around racing pylons, was killed in the crash of a slow, stable training plane in Louisiana on June 24th, 1934?

9. The Liberty Motor was designed by E. J. Hall and J. G. Vincent while locked up in Colonel Deed's suite at the Hotel Willard in Washington for just five days of uninterrupted work being completed on June 4th, 1917?

10. The Douglas DC-2, most widely used twin engine transport in the entire world, was designed in the drawing room of a train by Arthur E. Raymond and the late Harry Wetzel while traveling cross-country?

11. The National Advisory Committee for Aeronautics (N.A.C.A.) met for the first time on April 23rd 1915? It was the first organization in the entire world to build and operate a full scale wind tunnel?

12. Glenn L. Martin has been at the head of his own aircraft factory continuously for 33 years? Donald Douglas has headed his establishment for 22 years?

13. Pilatre de Rozier, Frenchman, made the first balloon ascent on October 15th, 1783?

If your

MODEL AIRPLANE NEWS

ARRIVES LATE

please remember that transportation and deliveries are rather uncertain in wartime. • Model Airplane News leaves the plant in what would ordinarily be plenty of time to reach you on or before publication date. But conditions beyond our control may delay its arrival.

14. The Alexander Eaglerock "Bullet," produced in 1928, was the first low-wing cabin monoplane, first cabin plane with a retractable landing gear, first commercial plane with a speed of 100 m.p.h. and had accommodations for four passengers and a dog carried in a special compartment aft of the cabin with a small window for canine sight-seeing?

15. A modern pursuit plane (350-400 m.p.h.) requires 3½ minutes or more than 20 miles to settle down to normal full throttle speed after straightening out from a comparatively shallow dive?

16. Royal Air Force fighters while in squadron formation on a "sweep" are directed entirely by radio from ground control stations where the relative positions of the R.A.F. and Luftwaffe squadrons in the air are charted? The squadron, in cloudy weather, is thus directed right into the midst of enemy formation several thousand feet in the air by an operator often more than a hundred miles away on the ground?

17. There was an air meet at Dominguez Field near Los Angeles in 1910, one of the first held anywhere in the world?

18. Few seaplanes and no large flying-boats can be taken off the water "with" the wind? Movement of the water surface by wind makes the feat an impracticality and greatly increases hull-water cohesion?

19. In the two years (1928-29) following Lindbergh's successful trans-Atlantic flight, a total of 31 attempts were made none of which succeeded in reaching announced destinations? Of this number 16 men and 3 women lost their lives in the attempts?

AEROFACTS QUIZ:

1. Most airplane control surfaces are balanced in three ways.

2. *Static* balance maintains the surface on an even keel while the ship is resting on the ground.

3. *Dynamic* balance maintains the surface on an even keel while in the air.

QUESTION:

How is *aerodynamic* balance achieved in the control surfaces of airplanes?

QUIZ NO. 1 WINNERS:

There were no winners to our first quiz concerning pilots flying higher than 33,000 feet since 100% oxygen is used at that altitude. Most answers suggested pressure cabins and pressure suits. There are no pressure cabin pursuit planes and a pressure suit would blow up like a balloon at high altitudes. Those huge suits worn by high altitude pilots are merely air-tight, electrically heated suits for warmth.

The effect upon the human body by climbing from 33,000 higher using 100% oxygen are identical to climbing from sea-level past 12-15,000 feet without oxygen. The higher the human climbs the slower becomes his reaction and the more hazy his mental powers. This is due to the decrease in the oxygen pressure in the lungs and the oxygen saturation of the blood. A pilot flying higher than 33,000 feet is strictly "on his own" and it depends largely on his mental and physical condition as to how high he can climb and how long he can survive. A neurotic person or a person with blood pressure varying from normal will lose consciousness very quickly. Army regulations state that flights to 35,000 feet may be made only with carefully prepared equipment and only for special studies or reasons and under no conditions is an Army pilot to fly higher than 38,000 feet irrespective of his equipment or his reason. Therefore, if foreign pilots are flying to heights as great as 40,000 feet they are endangering not only their plane and equipment but their lives as any failure of the oxygen apparatus would mean instant death. Under ordinary circumstances life ceases to exist at 47,000 feet even with 100% oxygen insofar as the atmospheric pressure at this height of 86 mm Hg exactly equals the combined 47 mm Hg partial vapor pressure and 39 mm Hg partial carbon dioxide pressure within the lungs. At this height a human being cannot survive for longer than 7 minutes.

Flight Lieutenant M. J. Adams of the R.A.F. nearly lost his life in setting the present world's landplane altitude record of 53,976 feet in a special Bristol monoplane on June 30th, 1937 and suffered from acute anoxemia (lack of oxygen) for many months afterward.

Superbly healthy and experienced high altitude pilots might be trained to operate at heights of 40,000 but this obviously has little military importance as the duration of the human system at this great height makes it impossible to fly or fight effectively.

VICTORY

Why Not Four Engine Fighters?

(Continued from page 7)

suffered in speed and range.

Examination of combat records show the twin-motor fighters, while having superior range to the single motored types, have not shone in battle; the principal reason being lack of maneuverability. While the single pilot can tight-turn at high speed and bring his forward firing guns to bear quickly on his adversary, the man in the twin-motor aircraft must make a wide sliding turn, a disadvantage in a dog fight. While he may have an edge on the single seaters in speed and climb, unless he can register a killing blow with his first burst of fire, he cannot afford to mix matters with the more nimble orthodox fighters, so twin-motor fighter tactics are mainly of the hit and run class. Against bomber formations, on which they can dive from high altitude and zoom downwards out of range they are particularly effective. In a recent engagement over the Aleutians three American P-38's put out of action five Japanese planes in a single dive and did not sustain damage.

Twin-motor fighters are more difficult to disable. During the Battle of Britain many ME 110's flew back to their bases with smoke pouring from one motor; single engine craft would have been completely out of action.

These bigger planes can carry more ammunition. The actual fighting time of a twin-motor fighter is probably three times that of the single engine craft.

In the former, however, range and augmented fire-power do not compensate for

loss of ease of handling. With fixed guns firing forward the pilot must aim his machine at his enemy, a great disadvantage if he cannot turn quickly. In the large machines this disability can be overcome by fitting a power driven turret behind the pilot, similar to that in the Boulton and Paul Defiant, which gave the German Stuka pilots such a terrible shock over Dunkirk. The Boche pilots were taken completely by surprise when the Defiants flew alongside and poured broadsides from four 30 calibre machine guns into them.

Undoubtedly a 360° arc of fire is one of the solutions to the twin-motor fighter's fighting deficiencies. This does not however solve the problem of increasing range to equal that of big bombers; stepping up ratio of invulnerability and lengthening the period of effective fire-power.

Shall we ever be able to produce a fighting plane able to go everywhere with bombers and carry sufficient armor and armament to enable it to fight for at least two hours of an eight hour flight?

We believe this is possible; there are many signs in the war skies that point to the eventual displacement of the single seater fighter by the four-engine battleship of the air.

Recently there appeared in a leading British aviation magazine a comment on the big daylight raid on Lille when 115 Fortresses and Liberators flew over occupied France accompanied by 500 fighter planes of various types. "From such a disposition of forces one would expect the bombers to have been entirely immune from enemy attack, and the fighter escort would come home with a long tale of victories to its credit." What happened was a complete reversal. The bombers were heavily attacked. They shot down forty-eight fighters with their 50-calibre guns, claimed thirty-eight as probables and damaged nineteen more. These figures were only published after more than 1000 members of the bomber crews were questioned and their reports cross-checked. Four of the big bombers were lost. The R.A.F. and U.S. Army Air Forces fighter squadrons lost no planes, but they could only be credited with the definite destruction of five enemy aircraft. "In other words," writes the British expert, "The bombers wiped the eyes of the Spitfires."

To many the Fortress' performance has been no surprise. The Boeing B-17 was designed for a specific purpose. In 1934 Boeing designers told the U.S. Army Air Corps they could build a plane that would serve the Army as the battleship would serve the Navy, so a year later the first of the type known as the 229 made its appearance. It justified the belief of the designers in that it could fly higher and faster than any existing pursuit. What it lacked, however, was offensive armament on the scale necessary for air combat as practiced today. Early Fortress bombers delivered to the R.A.F. lacked stinger turrets in the tail which has since been remedied and in addition the B-17E literally bristles with guns. Early in the Pacific warfare when the Jap's Zeroes attacked the few Boeings in action, American crews surprised them repeatedly by the use of side guns in improvised positions. Today the Fortress is the most heavily armed ship in the air.

The big Boeings have changed the course of the war. In the Battle of Midway they player a leading role in sinking Japanese ships, claiming about twenty by extraordinary precision bombing. As fighters they excelled anything we had in use. In three

months of action, apart from ships sunk, they accounted definitely for fifty Japanese planes and damaged more than twice that number. The Japs themselves paid the Fortress the highest compliment, and incidentally gave an indication of what may be the ultimate development of the fighter plane. Said the Tokyo radio broadcasting instructions to the Jap pilots spread over the Pacific, "The American B-17E is a four engine pursuit plane for all purposes, and is exceedingly dangerous."

Over Europe the men in the Fortresses marked up a staggering box score: during the month of October eighty German fighters were shot down, seventy of which were accounted for by the gunners of the "Forts." In the entire operations over Europe only seven of these big planes have been destroyed, although many have come back riddled with bullets and shell holes, with crew members dead and wounded. In one notable case, after the pilot had been wounded and the co-pilot killed, the bombardier, Lieutenant Sconiers, D.S.C., brought the plane safely to its base.

The Fortress has made good as a fighter because it combines qualities of a fightes with that of a bomber. To attack its vulnerable spots an enemy fighter pilot must dive from above and should he fail to deliver a knockout blow with his first burst of fire, which is practically impossible, he must continue his dive and recover out of range of the Boeing's many gun positions. By the time he has regained his altitude the Boeing, with a speed almost as good as his, will be many miles away.

The Fortress is many times less vulnerable than the single seater fighter because it has four engine "lives"; if the attacking pilot puts one motor out of commission, there are three others. If he succeeds in shooting up a second powerplant, the two others can carry on. Yes, even with three motors out, the machine can be brought down under control!

Supposing the enemy fighters concentrate on the pilot. Even though the pilot's cabin might be riddled with bullets, the pilot and co-pilot put out of action, the navigator or the bombardier can deputize. In this respect the Fortress has four control "lives."

With its four motors and duplication of pilot control the Fortress eliminates the main disadvantages of the single seater fighter.

In the matter of offensive armament it scores heavily, the present types of B-17Es have guns forward both above and below the fuselage. The gunner in the top turret can fire at an enemy plane approaching at any angle while the stinger turret in the tail looks after attack from the rear. All along the fuselage are gun positions that can be occupied instantly by the crew, meaning that with the exception of the pilot and co-pilot, every member of the Fortress can go into action with a machine gun.

The Boeing is the heaviest armored plane in use today; pilots, bombardiers, navigators and gunners are protected by armor plate capable of withstanding heavy calibre machine-gun fire. Should enemy bullets or shells pierce the less protected parts and start fires, as has happened, the crew is equipped to deal with such emergencies a major advantage over the single seater plane, where the pilot usually must bale out if his ship catches fire.

On range the Fortress has an easy edge over the smaller craft.

Actual Fortress range with full load of bombs is about 3000 miles and this can be considerably increased by eliminating the bombload which increases speed and improves altitude. With half its original bombload taken up by gasoline the Fortress could double its range. Augment its armament and ammunition to prolong its combat time, and you have the pattern for a four-engine fighter as tough as the present Fortress, but having the additional advantage of being equipped specially for fighting.

Minus its bombload, a Fortress' firepower could be doubled. At the moment Fortresses mount thirteen 50 calibre guns, the most deadly weapon in the air today, capable of piercing quarter-inch armor at 200 yards, and effective at 400 yards. As a purely fighting aircraft it could be equipped with one or two 37 mm. cannon which fires a one pound explosive shell and is effective from 700 to 1500 yards. It is heavy but efficient: an excellent weapon for opening attack at long range. There is even possibility of fitting a 75 mm. short barrelled cannon to a heavy airplane, firing explosive "grape" shot that could wreak terrible destruction at a range of 1000 yards.

A fast, high flying airplane with two 37 mm. calibre guns, twenty 50 calibres in sets of two or four, with perhaps a tail stinger turret of four 20 mm. similar to the "Chicago piano" arrangements on the decks of our battleships, would be capable of destroying anything that attacked it. Such ships would have many uses but primarily their function would be to escort heavy bombers. A squadron of Fortresses in formation escorted by twenty-five Fortress fighters would be almost impregnable.

For escorting shipping convoys these planes would be invaluable. They could purge the North and South Atlantic sea-lanes of enemy aircraft as well as to spot submarines. Modified "Forts" could undertake this work and tackle any normal fighter attack.

In "sitting" high altitude coastal and offensive patrols the machines would be ideal. While single-seater fighters have to land every hour or so, the four engine big fellows, bristling with guns, could stay aloft for an eight hour stretch.

Let us do a little designing of our own, to create a four-engine aerial battleship, taking the B-17E as a basic pattern. With four 1200 hp. motors, this aircraft has a speed something over 300 mph and weighs about 30 tons with armor, motors, crew and guns. With turbo superchargers operation at 35,000 feet is an accomplished fact. By eliminating bombload, of say four tons, we can develop fighter qualities in this machine, which has already shone as a destroyer of the air.

We need a machine that is faster and tougher, that calls for more power and heavier armor. Let us fit four of the 2000 hp. air cooled power units used in the U.S. Republic or the Corsair single seater fighters. With slight increase in weight we have better than 8000 hp., to give us more

The Curtiss Warhawk fighter carries a belly tank for long range flights

speed and faster climb. We need increased range. The more powerful engines will use more gasoline so we must use two of our spare tons for extra gasoline, carried in self-sealing tanks. After examining our power-weight ratio we discover the wing loading we can assign to armament and ammunition.

The potentialities of such a long distance fighter are fascinating. No enemy territory would be out of range, a squadron of these flying battleships based in Britain could go out to intercept enemy bombers over Germany and decimate their fighter escort, leaving the bombers helpless as sitting ducks. In the ultimate invasion of Europe they would play an important part in obtaining mastery of the air over Germany. Flying at 40,000 feet over Berlin, above AA range, they could keep the upper air clear for our bombers. Based on French or North African airports they could be dispatched to break up enemy air formations over Italy, Moscow or Stalingrad or from China or Alaska bases they could operate over continental Japan.

One of their particular functions would be to draw and destroy fighter opposition before the main bomber squadrons arrived. The single seater fighter is master of the normal unarmored bomber, but if over a period of time we can destroy enemy fighters faster than he can build them, we are eliminating this opposition and leaving a clear field for our medium and light bombers. If our four-engine fighter differed little in appearance from our four-engine bomber, the enemy would be unable to decide its function and puzzle whether to practise evasion tactics or otherwise. During the Battle of Britain R.A.F. pilots avoided enemy fighters and attacked the bombers—the depleted Luftwaffe is now doing the same over Europe. Our four engine heavy fighters would eliminate such tactics. Their use would quickly bring complete control of the air. Any city or area over which enemy airplanes can operate is at the mercy of that enemy. That nation with the longest reach and most powerful air punch will obtain overwhelming superiority. That is why we see an immediate and urgent demand for these heavily armored four-engine battleships of the air.

They may be already on the way!

VICTORY!

Building the Flying Scot

(Continued from page 29)

around the wood at all structure connecting points. The rear hook, shaped from number 12 wire, is now glued firmly into place. Cut two landing gear legs from 1/8" balsa and sandpaper to a streamline shape. Landing gear is glued onto the lower longerons that curve toward the nose, as shown in the fuselage side view. Check the tread before the glue hardens, so no mistake will be made.

A continuous axle of number 12 wire should be glued to the inside of the landing gear, starting at one leg, running up through the fuselage, down the opposite leg and out to receive the wheel. While on the subject, it was found that light celluloid wheels were quite satisfactory, a diameter of 2" allowing easy taxiing and good rolling characteristics in landing.

The rudder is shown full scale, as are stabilizer tips. Construct the tail of 3/32" sq. and 1/16" balsa. Be sure to leave necessary open space in the rudder to accommodate the stabilizer. This open space should jibe with the open space in the fuselage.

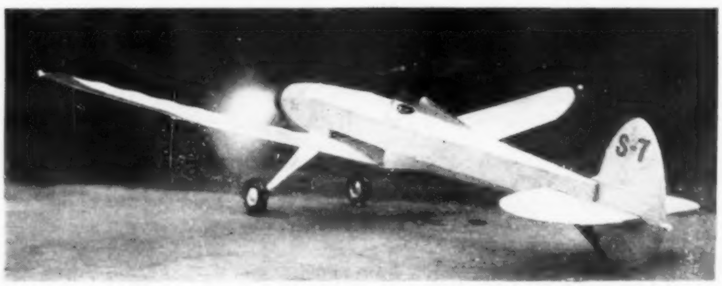
A small flap is found on the left-hand side of the stabilizer. This is cut from 1/16" flat and glued only at the front, so that it may be warped later to counteract tendencies which may make its use necessary. Sandpaper the leading and trailing edges of the tail to a rounded shape, to cut down resistance. A tail skid of number 12 wire is shaped and glued to the bottom part of the rudder. The model rests at only a slight angle of attack while on the wheels and tail skid. This makes for an easier R.O.G. flight.

Coming to the wing, we find that 22 ribs of the N.A.C.A. 23012 airfoil are needed. These are cut from 1/16" flat balsa. Two of them are cut from 1/8" flat, to be used as centersection ribs. The leading edge is cut from 1/4" sq.; main spar is 1/8" by 1/4", and trailing edge is cut from 1/8" sheet balsa to shape shown. Space the ribs at regular intervals, according to dimensions, and glue first to the spar, then to leading edge which is 1/4" sq. turned edgeways, or diamond shaped, and finally to the trailing edge. Wing tips, shown full size, are cut from 1/16" flat and glued into position after the two tip ribs have been somewhat shortened. Note the center section is of reduced chord to allow for a small backward or forward movement in the fuselage wing box, and to allow complete removal of the wing.

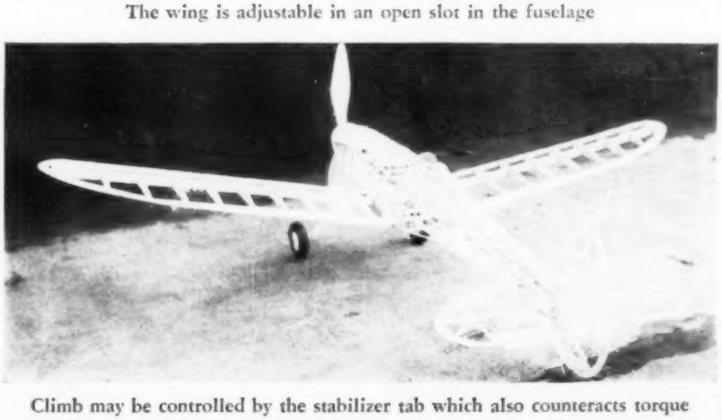
A dihedral angle of 2-3/8" is best incorporated by cracking the spars at the outside of the 1/8" centersection ribs. Prop up the wing tips until this angle is assured, then glue the spars solidly, placing the 1/16" flat fillet in position between the trailing edge and center section rib. The leading, trailing and wing tip edges should be sandpapered to a streamline shape. An incidence block of 1/4" sq. should be glued directly under the leading edge. A built-up block of 1/16" pieces may be built into the leading edge and covered over with paper, but although shown on the plans, this is optional.

A propeller or airscrew, as it may be called, is cut to shape from a hard balsa block 10" by 1-1/2" by 1". The outlines of the blades and spinner, which is carved integral with the blades, may be measured with dividers and compass on the half-size sheet and doubled directly on the block.

Take your time in carving, as a "club-type" prop will never do on such a finely built model as the one you will turn out. Blades are left rather thick, especially near the spinner. Give the prop about 4



The wing is adjustable in an open slot in the fuselage



Climb may be controlled by the stabilizer tab which also counteracts torque

coats of dope, sanding between each coat after it is dry, to insure an even airfoil shape, preferably of the Clark Y pattern. As the model glides very flatly, it is advisable to incorporate a free wheeler either inside the spinner or at the extreme tip.

Two skiis, to be used for winter flying, are cut from 1/16" and 1/8" flat balsa as shown in the full size drawing. The wood should be given the same treatment and finish as the prop blades, for strength, to eliminate friction, and to waterproof them in event of a slushy landing. Thread is attached between the pin on the ski and the pin on the landing gear leg. This thread should be slack enough to allow a hinge-like motion of the skiis, so that they ride parallel to the fuselage in flight and parallel to the ground at rest.

With completion of the wooden construction, covering is the next step. Large strips of paper are used to cover the fuselage. Where sharp curves are met separate pieces may have to be used to prevent wrinkling. Banana oil or heavy dope makes a good paper adhesive. Leave the wing box open at both sides to allow placement and removal of the wing. Do not cover the left side between formers 11 and 12, as access to the rear hook is necessary. No trouble should be experienced in covering the tail surfaces, as 4 large pieces of paper will suffice.

In covering the wing glue the paper to the leading and trailing edges, and the end ribs only. A separate piece is necessary for the tips. It is advantageous to have the grain of the paper run lengthwise from centersection to wing tips.

An 8 or 10 strand motor is connected between the rear hook and prop shaft. Use an S hook for machine winding.

A windshield is cut from celluloid to the pattern shown and glued into its respective position.

Spray the paper with water to tighten it. Then spray or brush two coats of light dope on the paper to give a smooth finish.

Assembly of the model consists of gluing the tail surfaces in place. They are of such a shape as to permit their being glued into position with no trouble in achieving correct alignment. No deviation from the centerline in either rudder or stabilizer is necessary. The wing is slipped through the wing box of the fuselage and held in place by rubber bands looperd over the wing and under the fuselage.

The original model is covered with yellow tissue, incorporating a deep orange scalloped design, orange noseblock, spinner and headrest, silver landing gear, prop blades and pitot static tubes. The pitot static tube is located on the sixth rib from the middle on the left wing. Such items as pitot static tubes (which may be cut from reed), venturi tube, instrument board, dummy lights, padded cockpit and padded headrest, etc., are optional, but go far towards sprucing up the model to look like a real plane. All this, including license numbers, personal insignia, etc., is left to the builder's ingenuity.

The glide should be long and constant, the model landing at about a level angle with the ground. Movement of the wing is allowed to a certain extent in the wing box. The model should take off with about 200 revolutions of the prop, climb smoothly and circle flatly to the right. With increase in power, the turn is much wider and flatter, so no danger of spinning or slipping is present. That small flap on the stabilizer can be used to produce an up or down force on the left-hand side of the model, which is about all the adjustment necessary. Do not alter the line of thrust. The difference in wing and stabilizer angles of incidence provides longitudinal stability.

The Royal Scot has no tricky characteristics. All the "bugs" have been taken out, so treat yourself to a fine flyer, and a fair and interesting addition to your model hangar.

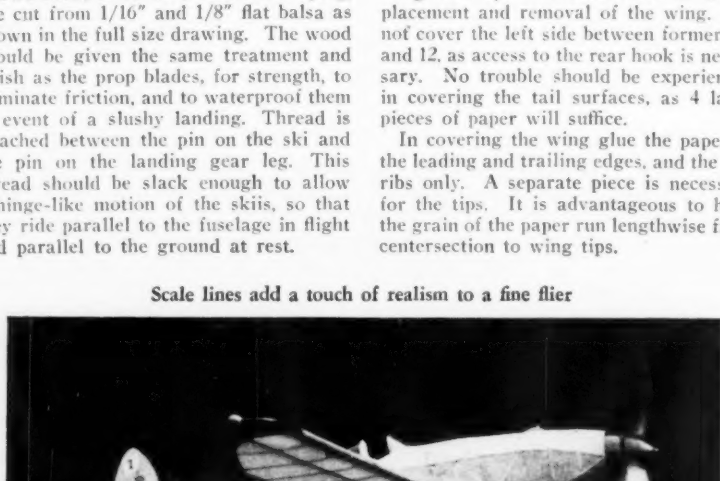
Bill of Materials

- 8 strips 3/32" sq. by 36" medium (for fuselage and tail surfaces)
- 1 strip 1/8" by 1/4" by 36" medium (wing spar)
- 1 strip 1/4" sq. medium (leading edge)
- 3 sheets 1/16" by 3" by 36" medium (formers, outlines, tips, ribs)
- 1 sheet 1/8" by 3" by 36" hard (trailing edge, landing gear, skiis)
- 1 block 10" by 1-1/2" by 1" hard (prop)
- 1 block 2" by 2" by 1/2" medium (noseblock)
- 1 piece 2" by 2" by 1/32" soft (cockpit)
- 1 length number 12 wire (36")
- 2 wheels 2" diameter
- 1 hardwood noseplug

Paper (2 sheets), glue, banana oil, dope, washers, eyelets, celluloid, reed and 16 ft. rubber.

VICTORY

Scale lines add a touch of realism to a fine flier



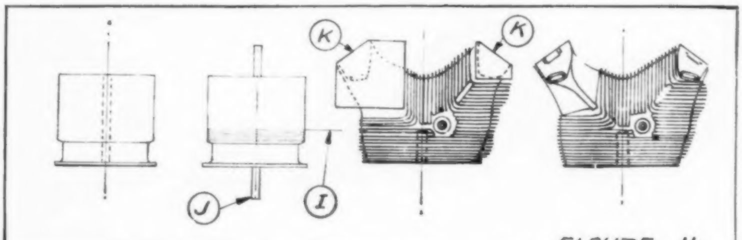


FIGURE 11
A SUGGESTIVE METHOD of MAKING UP EACH CYLINDER — 2 PEICES for 1 UNIT

Model This Twin Wasp Jr.

(Continued from page 9)

gear housing or nose Section (Fig. 6) is constructed from an aluminum casting and assembled into one whole unit before being installed on to the power case. This unit supports the engine thrust ball bearings, which absorb the axial and radial thrust loads of the propeller shaft. The bearings are housed in a flanged steel bearing, liner shrunk and forced into the housing. Provisions are made inside this housing to permit installation of reduction gears and built-in drives for the constant speed propeller governor or a manually operated valve for the controllable pitch propeller. This inside section also contains oil lines, which operate the devices for the controllable pitch propeller Valve. (C in Fig. 2).

POWER CASE SECTION: The power case or crankcase section of every Twin Wasp and Wasp Jr. is made up of three sections. (The front third is the section looking forward from B-B, middle section is the section from B-B to C-C; and the rear third is from section C-C to the rear as shown in Fig. 7, side view.)

This case is machined from a forged aluminum alloy, jointed together by 14 machine bolts or screws. Tappet guides are rigidly inserted in tappet holes for perfect alignments with the cams. Cams are located in both ends of the case; these operate the opening and closing of intake and exhaust valves at the proper times. They are supported by annular shelves mounted in the case. The connecting rods of I crossection and the master rods are machined from steel forgings. All shafts and rods before assembly are highly polished and magna-fluxed to prevent magnetism.

SUPERCHARGER SECTION: The supercharger section is a machined cast magnesium alloy case. This section houses a centrifugal supercharger and is mounted on the axis of the crankshaft. The impeller of this unit provides a steady precompressed mixture of gasoline and air in correct proportions at all altitudes, by transferring kinetic energy of gas from the impeller tips into pressure in the annulas and feeding the intake pipes by means of an interposed diffuser.

ACCESSORY SECTION: The accessory section is a compact unit cased in a light magnesium housing. This case contains drives for the following: starter, generator, two magnetos, fuel pump, oil pump, two tachometer connections and a vacuum pump. The carburetor unit consists of the carburetor section (G on Fig. 2), the carburetor heater or better known as the "hotspot" (F on Fig. 2) and are attached together by machine bolts to a horizontal flange on the rear of the section. (See Fig. 9 for better idea of this unit.)

CYLINDERS OF THE TWIN ROW WASP JR.: Twin Row cylinders are very much smaller than cylinders of single row engines of the same displacement. This twin row system permits higher engine speed without excessive engine wear and cylinder pressure. The cylinder barrels (Fig. 12) are of hardened steel and the fins are machined to shapes, then the barrel is screwed and shrunk into cast aluminum heads. These aluminum heads have whole casted rocker boxes and the valve sections are machined before barrels are attached to the heads. Provisions are made on each cylinder to permit the connection of engine cowl by means of bosses, and for attachments of baffles.

CYLINDER BAFFLE SYSTEM: All baffles installed on the Twin Row Pratt & Whitney engines are of patented pressures type. These baffles increase the engine's cooling efficiency by forcing air around all spots on the front cylinders to all places on the rear cylinders in such a way that uniform cooling is accomplished. This prevents localized "hotspots" and uneven cylinder temperatures. These baffles are of pressed duralumin sheets, attached to the cylinders by small bolts and spring lugs. Figure 12 and 12A

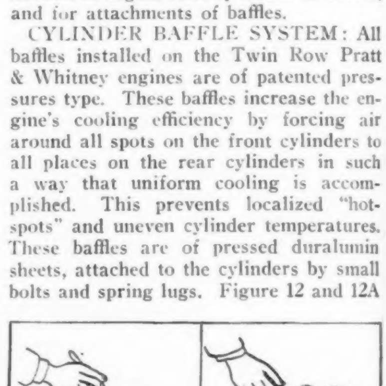


FIG. 17
METHOD of MAKING A MOULD for CASTING PLASTER of PARIS' CYLINDERS

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KEEP ON BUILDING MODELS FELLOWS . . . FOR YOU ARE BUILDING CAREERS TOO
The building and flying of model airplanes is the gateway through which thousands of young Americans have found their places in the industrial, commercial and professional life of the nation and in the various branches of Uncle Sam's Services.
This is true because through your hobby vision is acquired; facts are absorbed and skills are developed which lead directly or otherwise to the work you will do in later years.
The National Aeronautical Association has asked me to put them in touch with experienced and serious minded model builders for special model work at the nation's largest aircraft development laboratory. If interested in such a position write me at once, sending stamped and self addressed envelope.
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give you the idea how they should look on each cylinder.

BUILDING THE DUMMY TWIN ROW MOTOR: Before we start to build the motor we should study the entire engine drawings. After you feel quite sure you understand the drawings and the motor features, choose your purpose for constructing the model and how you want it built. If you want it for a desk piece, make your plans for this; if you want to make the motor appear real inside of an installed engine cowl, and not build any detail behind the rear cylinders, then make your plans on how you are going to attach it to your airplane; and if you are going to build the entire motor and mount it exactly like the real airplane motor is mounted, then make your plans to indiacte how your motor is going to be built and attached to the motor mounting ring.

Choose the scale you prefer to build the model and follow this throughout the entire construction when scaling down all dimensions shown on the drawings.

The power case should be built first, then the other details added onto this case. We are suggesting a method of constructing the power case which is rather difficult to build, but exact form can be obtained by following these instructions and by being patient.

First make a template out of stiff drawing (heavy) paper or stiff thin metal sheets of Section B-B and C-C as shown in Fig. 7. (Both sections, B-B and C-C are of equal angles and shapes but of opposite directions.) On this sheet to be made into templates scribe a circle equal to 8-5/8" radius (see front view, Fig. 7) and then divide this circle into 7 equal parts or sectors. (One part or sector is equal to 1/7th circle or 51 degrees, 25 minutes and 42 seconds.) At each point on the circle draw the cylinder centerlines toward the engine center as shown in Section B-B and C-C. At each point where the cylinder centerlines cross the scribed circle (8-5/8" R.) draw 7 lines at right angle to each 7 cylinder centerlines, to form the shape as shown in the two crossections B-B and C-C. After this template is made study the entire plans on the power case. Note how the cylinders' bases are of opposite angles in front and rear rows or banks . . . note how they should appear in the front and rear views.

The best way to make this entire unit is get a block of wood and turn it down on a lathe to the approximate diameter of 1/16" to 1/8", 9-5/8" R. (See side view, Fig. 7.) While it is still between the lathe centers mark the cylinder rows or banks centerlines all the way around the entire cylinder wooden form. Then scribe a centerline lengthwise across the form to give the top cylinder centerline; turn the cylinder block halfway around and scribe another centerline, which is exactly on the other side of the top centerline, which will be the bottom front cylinder centerline. Take a caliper and measure the outside diameter (O.D.) of the wooden cylinder from and draw a circle on drawing paper to the exact diameter of the caliper or wooden form.

Now divide this circle into 7 equal parts just like you divided your template of Section B-B and C-C. Spread your dividers to the width of the new circle and test it out on all 7 points on the circle for exact division; then test it out for exact division on the cylinder banks centerline. If it divides each two centerlines into 7 equal parts on each bank line then begin to lay off the cylinder centers on each bank by carefully following these instructions:

On the top horizontal centerline that crossed the rear cylinder bank centerlines place a plain point at the intersection of these two lines. Now turn the block halfway around and place a point where the bottom centerline crosses the front cylinder bank centerlines. Check these two points over and over to make sure you have marked off the exact location of the rear top cylinder and the front bottom cylinder. (Compare with Fig. 2 and 7.) After you are positive that each bottom and top, front and rear cylinders are marked off correctly take your dividers and start from the top cylinder center and begin to divide the rear cylinder banks centerlines into 7 equal parts for the location of each cylinder's center. Repeat the same process by turning the block halfway around and begin to lay off the centers of front cylinders on the front banks centerlines, from the center of the bottom front cylinder, dividing the circle (banks centerline) into 7 equal parts.

Now take the block and examine the layout to make sure you have centered the 14 cylinders accurately on both cylinders banks by comparing your results with the plan as shown in Fig. 7. See if all front cylinder centers are exactly in the middle of the space on the rear banks centerline between the two rear cylinder centers . . . just to be doubly sure, turn the block around and look at it from the rear and see if the centers of the rear cylinders are exactly in the middle of the space between the two front cylinder centers on the front cylinder banks centerline.

After you are reasonably sure the centers are exactly located begin to drill each cylinder centers with a pilot drill. After you are finished using the pilot drill start to drill the cylinder barrel holes, about right through to the center of the base. (Consult drawings of cylinders, Fig. 12 and 12A, to determine the size drill to use.) When drilling make sure you are drilling the holes at right angles to the absolute center.

After the entire 14 cylinders are drilled begin to turn out the front and rear shapes of the power case where the tappet holes are located. Use the same procedure to lay out the tappet holes but make your layout drawing by referring to Fig. 4 and 5, also using the data as shown in Fig. 7, side view.

After all tappet holes are exactly located drill holes in each tappet location. For exhaust and intake location on the front and rear cylinders consult the side-view, which shows where each tappet rod is located, and compare them with the location of the rocker boxes which houses the intake or exhaust valves or outlets as shown in Fig. 3, 12 and 12A. The front

view location of both tappet rods are directly the opposite of the rear view, in regards to intake and exhaust rods. After all tappet holes are laid out and drilled begin to shape the cylinder bases to the shape of the template of B-B and C-C.

Before you start to shave away the surplus make a solid plug gauge to exact shape of the cylinder barrel as shown in Fig. 12. Make sure the gauge barrel diameter is the same size as the cylinder holes you have drilled on the case; also be sure you make the cylinder base on the plug gauge at 90 degrees or right angle to the barrel so the plug gauge can be inserted into the cylinder holes to check the trueness of the flat cylinder base while you are planing it down. After you have done a little planing, stick the plug gauge in the hole and see if all sides are 90 degrees to the cylinder holes. Also check the section with your template to insure that it is being shaped as it should be, Fig. 7, side view. Carefully shave away the surplus until you have obtained the exact form. Then begin to trim away the odd corners to make it appear like the drawing of the power case show. You are now ready for the nose or gear housing section.

GEAR HOUSING OR NOSE SECTION: It is best to turn the gear housing to the true shape, shown in Fig. 6, on a lathe. Making a template of this section will insure accuracy. You may make this unit with or without the propeller shaft. (Consult Fig. 14-A also.) After it is shaped begin to attach all rear cowl studs and round off all rear corners as noted on the drawing. Next add the controllable propeller valve mechanism, then the oil strainer unit; then round off all corners. Now add nose ribs by gluing strips of narrow balsa in each rib position as shown in the finished drawing. After all strips are glued begin to "finish up" the rough strips or ribs by trimming with a knife and fine sandpaper, ending up the completion of the nose section by rounding off all corners as noted: and by painting the unit gray, with exception of all metal parts.

SUPERCHARGER SECTION: If you are going to build the entire motor this section, besides the power case, is very difficult to build. There are no sharp corners, except bolt holes, and the entire section is practically one unit. It can be built-up with striking realism, or carved to shape by long painstaking work. It is best to turn the center disc on the lathe and add intake pipe outlets on later, by gluing each outlet separately until all outlets are attached firmly. Then round off all corners by the use of filling compounds such as bees-wax, putty or plastic wood. To insure accurately the attaching of mounting holes it is suggested that a jig form be built before bolt holes are drilled. A simple jig can be made by the following method: First, draw up the plan of the supercharger front or rear view, that will give you the exact location of each bolt hole. Second, drive small nails, the size of the bolt hole's diameter, into each eight bolt holes; make sure the nails are in straight and that the nails' height are over the thickness of the side-view of the supercharger section as shown in Fig. 8. After the nail-heads are snipped off sharpen each nail-tip into a pointed cone so that when you lay the supercharger section on top of these nails they will make impressions in the supercharger unit. This will give you the exact location of each bolt hole, if you are careful in lining the unit up with both horizontal and vertical centerlines. After you have drilled the holes set this jig aside for further reference when you build the motor mount for your airplane. This entire unit is painted gray.

ACCESSORY SECTION: The Accessory Case, as shown in Fig. 9, is about the easiest part to build of the entire motor. This case consists of square and round forms on a disc background or support, which is bolted to the rear of the supercharger section. Shape the middle section before you add the outer section, as shown in all views. When this is completed paint it all gray with the exception of any exposed metal parts such as the bolt nuts.

Now start to carve the fuel pump to the sections as shown and finish it up by painting all gray and attaching it to the bottom of the case. After the fuel pump is attached firmly add some metal part underneath the pump to give the motor a business-like appearance.

Now start to carve the carburetor heater and entire unit. When it is all shaped finish it up as noted on the drawings of each unit: The heater or "hotspot"

should be painted a shiny metal gray and attached to the motor case first. The carburetor unit is painted shiny black and attached underneath the heater as shown in Fig. 2 and 3. After the two sections are attached, for realism purposes, add all shiny metal fixtures such as bolt nuts, tie wires and control horns, into their respectful place. Consult all drawings on these two units.

MISCELLANEOUS: The wiring harness, as shown in Fig. 10, can be made up by the following means:

Use aluminum tubing for the manifold and shape it carefully to required form; watch out for kinking when you are bending it. All spark plug wires can be made from plain small-gauge copper wire. Some models of this Twin Row Wasp Jr. have different colored wires for the spark plugs: such as red, orange, green, and are used for easy identification of different models of this motor. All attachment nuts can be either cut from wood or metal to their shapes.

All oil lines with the exception of oil-line ABC, which is of aluminum, can be twisted to shape from common copper wire. Intake pipes also can be made of wire twisted to shape, painted shiny black for striking effect. It is best to shine up all exposed copper oil lines, for appearance before installing on the motor.

The cylinders, as shown in Fig. 12 and 12-A, can be made to almost-realism by following these suggestions. The section from the lowest part of the barrel to the top fin above the spark-plug hole can be turned out on the lathe to almost exact shape. The barrel section could be threaded with fine cotton or silk threads as shown on the "Cyclone F-2" plans.

Before threading it is best to drill through the center, to insert a dowel that is the same size as the holes A on Fig. 1. The main fins can be either built up or shaped on the lathe, but it is suggested the upper half be built up of alternating layers and the rocker houses carved separately from the block, as shown in Fig. 11. (It's best not to attach the houses until it is all carved.) When the entire upper half of the cylinders is finished, glue the two halves together and attach to the motor block one at a time.

If the model builder wishes to make an exact pattern of one cylinder and cast the others from this pattern, here are our suggestions. On the market there is a company that manufactures liquid rubber in two states (conditions) that will enable anybody to make flexible moulds. To use this method the pattern must be made first and the first rubber is applied like paint; the second rubber is applied like putty to a window. This company's product comes in two cans, called "Number 1" and "Number 2." Number two is painted on the pattern in 6 or more coats; each coat is applied after the preceding coat is dry (Fig. 12). When a sufficient thickness of number two is obtained, then spread on number one; Fig. 13. Put the mould away after a sufficient thickness of number one is secured and let it stand for about 24 hours. When number one is dry and hard cut an opening around the mould in such a way that it will permit you to remove the castings with the greatest ease, Fig. 14. On Fig. 15 you will see that adhesive tape is used to keep the opening together; and that the dotted box is a suggested support for the mould. Make the support out of plaster or a carved block. Turn the block around as it appears in Fig. 15.

In Fig. 16 you will notice how to sift the plaster into the bowl of water. To make the proper plaster mixture, use plaster of Paris, fill up the mould with water and dump the water in a bowl. Now add the plaster as shown in Fig. 16; be careful to build up an even pile and when the plaster is even with the water let it stand for 10 minutes. Then slowly mix the plaster with a circular movement for a few seconds. When through pour the plaster into the mould very slowly to prevent the formation of air bubbles. Put the mould in a warm dry spot to harden; when the plaster is hard, remove the tape and carefully open the mould to remove the casting.

The baffles were made of stiff paper, glued and wrapped around the cylinders and on the heads as shown in the baffle layouts in Fig. 12 and 12A. This should be varnished (the paper baffles) after it is attached to give the paper stiffness, and the varnish should be dry before you paint it shiny black. Cloth can be used instead of stiff paper, varnished to give it stiffness after the cloth has been glued to the cylinders; then later painted shiny black.

The Hamilton Standard Propeller hubs were drawn so that you can build the hub in correct proportions to the motor. The shaft, as shown in Fig. 14A, was suggested for the following reasons: it will add realism to the motor and entire centersection; it will give your propeller a true and better support; and if mounted right, it will not warp the propeller out of alignment or it will not run off-center like nailed propellers do. This shaft can be turned out in your own machine shop, your high school machine shop or it can be made very reasonably (should not exceed $1 for labor and materials). When it is installed on your motor you'll be surprised at the snappy appearance it will give your propeller and motor.

When making the propeller shaft unit, first make the shaft, then the collar to fit (with about .001" clearance to allow free-wheeling) the shaft. It is suggested that the shaft should be threaded with fine S.A.E. thread; and before you attach the shaft to the gear housing, ask or consult the tap drill size chart to find out what size hole you should drill in the gear housing to fit your size thread on the shaft. The machine screw may be obtained from your local watchmaker; if he does not have any in stock that is nearest to the size you want, ask him where you could obtain it, as he most likely has a catalog on these fine screws, bolts and nuts that can be used with beautiful effect on other parts of your motor, besides the propeller hub unit.

If the entire motor is carefully and neatly made it will add greatly to your

model airplane's appearance. We have seen plenty of beautifully built models of airplanes but which had a faulty looking motor that marred or ruined the whole appearance of the model airplane. For this reason the motor plans were drawn to aid model builders in putting more "life" into their airplane models.

The writer will appreciate any suggestions or criticism on this motor plan or any other plans; he will answer any questions that are sent to him with an enclosed stamped envelope. MODEL AIRPLANE NEWS will continue to publish plans of super-detailed airplanes that use this engine.

VICTORY

Design for Performance

(Continued from page 17)

ting ahead of the story. Let's see about this performance problem.

BASIC FLIGHT PREDICTION: Offhand it looks as though it would be a plenty tough job to predict how an airplane is going to fly. Well, you're right, it is; but by sneaking up on things one at a time you'll be surprised how easy we can make it. For example let's take a simple glider model. We all know that if we make a particular adjustment and launch the model it will glide with a definite forward speed and vertical sinking speed. But what we may not realize is that for every steady forward speed (which we may obtain by various adjustments) there will be one and only one steady sinking speed. This means that for a given airplane we should be able to obtain a single curve of sinking speed (Vs) vs. forward speed (U) such as that shown in Fig. 1.1. Notice that such a curve immediately gives us five important items:

First, point A on the curve corresponds to the lowest forward speed or *stalling speed.*

Second, point B corresponds to the lowest sinking speed or *minimum sinking speed.* This is the proper adjustment for maximum gliding endurance.

Third, point B also gives us the *forward speed for maximum endurance.* We will see that it is necessary to know this speed in order to properly adjust our model for endurance.

Fourth, by drawing the tangent line OC we locate point C which corresponds to the *forward speed for maximum gliding* distance. That is, corresponding to the maximum lift to drag ratio and,

Fifth, point C also tells us the *maximum lift to drag ratio* itself which may be obtained by dividing the forward speed at point C by the sinking speed at point C. That is, if the forward speed for maximum gliding distance is 30 ft. per sec., and the corresponding sinking speed is 2 ft. per sec. the maximum gliding ratio will be 15 to 1.

In fact, we may calculate even the maximum time to descend from any given altitude with any known rising air current by the simple equation:

1.1) $$\text{maximum gliding endurance} = \frac{\text{altitude}}{\text{min. } V_S - \text{speed of rising air}}$$

Thus, if we have a minimum sinking speed of 3 ft. per sec. and launch the model from an altitude of 200 ft. in a current of air

rising at a rate of 1 ft. per sec. the endurance will be,

$$\text{maximum endurance} = \frac{200}{3 - 1} = 400 \text{ seconds}$$

Whereas, if the riser hits 3 ft. per sec., the endurance becomes infinitely large and the model will never come down—until it flies out of the particular rising current of air.

Well all this looks simple enough, eh? There's only one drawback—we don't yet know how to obtain the forward vs. sinking speed curve. Of course, if the model is already built we might obtain it by actually gliding the model. Incidentally, this is where the "steady" speed business that we've been talking about comes in; for to obtain accurate data the model must be carefully launched so that the forward and vertical speeds are constant or "steady" during the entire glide. Actually, however, we are much more interested in predicting our curve *before the model is built.* As this is going to require a little study let's examine first one other element of the performance problem; that is, the effect of engine power.

THE EFFECT OF ENGINE POWER ON A MODEL: Fortunately aeronautical engineers have invented a very clever dodge. Let's say, for example, that a particular engine puts out a certain amount of horsepower. By multiplying by a conversion factor (550) we convert this horsepower to foot pounds of work per second. Now, if it were possible to use all of this work to raise the airplane the rate of climb could be obtained simply by dividing the foot pounds per second output by the airplane's weight. With an actual airplane this is always somewhat optimistic as not all of the power can be used to raise the plane. In the first place, we must make allowance for power lost at the propeller, by introducing a *thrust horsepower* equal to the product of engine horsepower and propeller efficiency. If we now convert to foot pounds per second and divide by the weight we have an important quantity which we shall call the rising speed, i.e.,

$$\text{rising speed} = \frac{\text{engine HP x Prop eff. x 550}}{\text{weight in pounds}}$$

Fig. 1.1 shows a curve of rising speed vs. forward speed. Note that the rising speed gradually increases with increasing forward speed. This is due to the fact that for models the propeller efficiency always improves as the forward speed increases—but don't jump to the conclusion that the actual climbing speed will improve for, so far, we have neglected the loss of climb due to drag of the airplane itself. But wait a minute, the loss of climbing ability due to airplane drag must be exactly the sinking speed which we have already obtained. That is the rate of climb at any forward speed must be given by the formula:

Rate of climb—climbing speed (V_r)—sinking speed (V_s) i.e., the distance between the two curves on Fig. 1.1 is exactly equal to the rate of climb. Thus the *maximum rate of climb* occurs at the point D where the two curves are furtherest apart.

Note the corresponding forward speed is somewhat higher than the speed for minimum sink due to improved propeller efficiency. Point E is also interesting for here the two curves cross and V_r is equal to V_s. Eureka! This must be the *maximum speed for level flight*, for in order to obtain a higher speed the airplane will have to be dived. Note there is another level speed at point F. However it is usually not very important as it is normally above the stalling speed.

Well it looks as though the combination of these two curves will tell us everything we need to know about the performance of our model—now all we have to do is find a way of drawing them—simple, eh. Time is almost up for now so we'll just mention a few high points of the procedure.

First, to obtain the sinking speed curve, essentially we'll have to determine the drag at various forward speeds—but it really isn't as bad as it sounds. And to make our labor especially worthwhile we'll stop to find out just what causes the three types of drag and how to reduce them to a minimum.

Second, to obtain the rising speed curve, we'll need the propeller efficiency—which is relatively simple compared to finding the drag. Finally we'll investigate the problem of obtaining stable flight:—All of this will be in our next installment.

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VICTORY

The Claustrophobia Crate

(Continued from page 21)

inch square stock sanded slightly. Cement to tail boom as shown.

Stabilizer—made in two halves and curved in the same manner as the rudder. After trimming to shape, cement the two halves together, using an even butt joint. Add three ribs, each of 1/32 inch square balsa stripping.

Wing—the elliptical-shaped, low-aspect ratio wing is constructed in two halves like the stabilizer. The leading and trailing edges, and tips, are bent from 1/32 inch square balsa strips. The ribs are fashioned from 1/32 inch sheet balsa and are 1/32 inch wide. The wing halves are cemented together with but little cement. This is a temporary point while the wing is being covered with microfilm. After covering the wing halves are broken apart, and re-cemented together at the proper dihedral angle illustrated.

Covering—this is a slightly heavier microfilm than is generally used on most indoor models. The reason for the heavier "mic" is the model may be expected to bounce around a bit off walls and the ceiling when flying in a confined area. Hence, rips or tears in the 'film will be fewer if the covering is strong.

Wing Struts—made from 1/32 by 1/16 inch balsa strips cemented to the right wing leading and trailing edges as shown. Note differences in length. By "off-setting" the struts, and giving the left wing more "lift," the model will not be so apt to spin in while making tight circles to the left.

Propeller—is bent from 1/64 inch thick sheet balsa. First cement the flat blades each about 3-1/4 inches long and 1 inch wide to the hub which is 1/8 inch square, and 1/4 inch long. Use medium hard balsa for the hub. After the blades are securely cemented to the hub at an angle of 45 degrees, steam them to a slight airfoil shape with less angle at the tips than at the center. When sanding the blades to shape, the propeller can be trimmed down until its diameter is just 6-1/2 inches. The prop shaft is of .010 music wire. Don't forget the washer.

Assembling—with all the parts completed, cement the stabilizer to the tail boom; the boom to the motor stick; and finally, the wing struts lightly to the motor stick in about the position shown.

Testing—using a 4 inch loop of 1/32 by 1/30 inch rubber, and with this and the propeller in place, glide the model. Move the wing struts if necessary until the best glide is obtained, then cement the struts in place permanently with additional coatings of glue.

Flying Adjustment—to prevent side slipping in the very tight circles which the model will be required to make in small rooms, it may be necessary to give considerable "wash-in" to the left wing. The tighter the turn, the more "wash-in" will be required.

Experiment with the length of the rubber motor, since this is one of the most effective methods for controlling the height of indoor flying models. The longer the loop, the less altitude possible.

So there you are, gentlemen. How do the flights of your claustrophobia model compare with Mr. Maxwell's?

VICTORY

Sky Scouts

(Continued from page 16)

lbs. Maximum speed, 310 m.p.m.; cruising speed 200 m.p.h.; range, 1,490 miles.

PLANE 1C—Nakajami Type 19, an all metal long range bimotor bomber equipped with two 870 hp. Mitsubishi Type IV engines. Of mid-wing cantilever design featuring monocoque construction and stressed skin flush riveted covering. It possesses split-type trailing edge flaps and retractable undercarriage folding forward and up into motor nacelles. Of clean aerodynamic design with statically and aerodynamically balanced elevators and rudder, the craft appears to possess excellent flight characteristics which make for good bomber aircraft. Information regarding performance or additional design characteristics and dimensions unfortunately are not available at this time.

PLANE 1D—Mitsubishi Otori (Phoenix) is an all metal low-wing cantilever type monoplane equipped with two 550 hp. Nakajima Kotobuki III radial air-cooled engines. First designed by order of the Asahi newspaper, it was flown over 2,000 miles from Tokyo to Bangkok non-stop. Capable of accommodating crews of three to five, this craft now becomes a formidable weapon. Modified undoubtedly from its inception, the Otori may now be in use by the Imperial Navy, operated from aircraft carriers. If such is the case one may safely venture a prediction that this type of machine will be among those used for bombing American strategic positions and cities. Unfortunately, at the time of this writing little information regarding it was available.

PLANE 2A—A long range Naval patrol bomber of unidentified manufacture greatly resembling the Sikorsky flying boats; apparently a product of the Japanese Naval Aircraft Factory. Reputed as having a 3,000 mile range, the craft undoubtedly compares in performance to our own four motor boats. Practically undistinguishable from the Sikorsky excepting for the "floating" type ailerons, no doubt a Germanic influence, this craft will prove extremely difficult to "spot."

PLANE 2B—The Nakajima 96, a Naval Torpedo bomber used in close cooperation with the Nipponese Navy units and operable from aircraft carriers. Sufficiently formidable in fire power and armament although sluggish in appearance, the craft assumes an important role in Japan's war efforts. Easier to "spot" than many of the other Japanese fighters because of its somewhat "dated" lines, the Nakajima 96's appear to be much like a Hollywood Production. In appearance it possesses a little of everything of '30 vintage.

PLANE 2C—The Nakajima 95, single seat ship-

board fighter. Capable of some 200 miles per hour, the craft is believed to be a "souped up" version of the Nakajima 90 originally powered with 450 h.p. Japanese manufactured Bristol "Jupiter," renamed the "Hotobuki." In appearance, the craft is identical to the Boeing P-12 excepting for the wheel pants which are typically "British." Lacking in fire-power, and easily recognizable, the tiny Navy fighter will undoubtedly find it "tough sledding" after Uncle Sam's lads spot it.

PLANE 2D—The Mitsubishi 97, a light bomber serving the Mikado's Army efficiently and effectively. In appearance it resembles the Northrop A-17 with semi-enclosed type wheel pants similar to those first adopted by the Curtiss-Hawks of past years. It is powered by a single, liquid cooled engine of unknown make and horse power. Its somewhat blunt shaped nose, slender cockpit, enclosure and strikingly outmodish undercarriage should make it readily recognizable to all Sky Scouts and Aircraft Spotters.

PLANE 3A—The Nakajima 97, single seat low wing fighter assigned both to the Japanese Army and Navy squadrons. Powered by a radial engine completely cowled, the craft is equipped with two fixed machine guns of unknown caliber synchronized to fire through a three-bladed propeller. Its thin wing may house two additional guns; however this is doubtful. Greatly resembling the first low-wing Boeing fighters, the "97" becomes easy prey to the Sky Scout inasmuch as its thin oval fuselage, fixed landing gear, and forward located cockpit with its oversize headrest cannot be associated with any other fighting craft used by the Japanese. Reputed as having a speed in excess to 250 miles per hour, and an endurance range of approximately five hours, the appearance of this craft automatically forewarns of Naval units nearby, and of impending Naval action.

PLANE 3B—The Nakajima "91," single seat high wing fighter of '37 vintage. Powered by an imitation Bristol Jupiter engine, the craft is capable of speeds in the 200 MPH neighborhood and has proven to be a very maneuverable and capable fighter. It mounts two Vickers machine guns firing through the propeller. The engine is encircled by an anti-drag ring while each individual cylinder is faired by a cone placed directly aft of the engine. Its complex array of struts, and antiquated engine fairing arrangements are its primary points of recognition. The craft appears to have a fabric covered wing and tail. The fuselage is fabric covered aft of the cylinder fairing to the tail surfaces. The forward portion is of necessity metal.

PLANE 3C—Mitsubishi "Hinazuru" (Young Crane) is the Japanese version of the English Airspeed Envoy. Originally manufactured by the Mitsubishi Company under license along with the required "Lynx" IV-C engines as an eight passenger transport and now fitted for military assignments as a bomber. The conversion from transport to bomber requires only the addition of bomb racks and machine gunners turret. Designs permitting this conversion were first developed in 1936 and have hence been molded to perfection. The Envoy or "Hinazuru," as the little "yellow men" call it, is a low wing cantilever monoplane of wood construction, with covering of plywood and fabric. The craft has a speed well within the 200 MPH range and a flight range of over 600 miles. Its initial climb is about 1,250 ft. per min. and its service ceiling approximately 22,000 ft.

PLANE 3D—The Kawanishi 95, two place Naval observation craft equipped with float and capable of operating from battleships similar to our own Voughts. Powered with a radial engine of unidentified manufacture, completely housed in NACA type cowling, the Kawanishi bears a striking resemblance to the early Chance Vought single float fighters used by the United States Navy. The resemblance is almost exact except for the odd shaped rudder which presumably "honorable" Japanese designers have changed primarily to avoid "unfavorable" criticism from the originators of the design. The craft is armed with fixed and movable guns and also carries the equivalent of our 100 lb. bombs beneath the wings. Two such bombs are carried on this Jap craft.

PLANE 4A—Known as Army type 98, in reality a Fiat BR 20M first adapted by the Japanese Army in 1938. Eighty aircraft were purchased by the Nipponese and commissioned immediately. After extensive trials, the airplanes proved satisfactory and arrangements were made to produce these in Japan under license. Since then, large quantities of these bombers were delivered to Army squadrons and have seen considerable action in every Jap theater of operation including Pearl Harbor.

The craft was originally powered by two 1,030 h.p. Fiat A80 RC41 air cooled motors. These it is believed are also being manufactured under license by Japanese manufacturers at the present time although under a Jap name. Construction is all metal with both metal and fabric covering.

The craft mounts three flexible machine guns: one in the nose, another in a retractable Breda turret at the top of the fuselage, and another in a prone position beneath the fuselage aft of the wings. Normal flight crew numbers five men. The craft is known to have a 2550 lb. bomb capacity with a range of 1,240 miles.

Dimensions are as follows: Span, 70 ft. 6 in.; length, 52 ft. 10 in.; height, 14 ft. 1 in.; wing area 796 sq. ft. . . . Weight—empty 14,300 lbs.; loaded 22,220 lbs.; wing loading 27.9 lbs. per sq. ft. . . . . Max. speed, 268 m.p.h. at 16,400 ft. Max. speed at sea level, 233 m.p.h. Max. cruising speed, 217 m.p.h. Initial rate of climb 1,000 ft. per min. Service ceiling 29,520 ft.

PLANE 4B—The Kawanishi 96, dive bomber. Used aboard carriers, the Kawanishi 96 acts as scout bomber and torpedo carrier alternately. It is powered by an air cooled radial engine of unknown manufacture, and carries a crew of two in addition to a half ton of bombs. No details as to performance or armament are available at this time.

PLANE 4C—The Nakajima 98, two seat light bomber, details of which are not available as yet. The craft is believed to be used by Army squadrons and described as "quite formidable."

(Note: Information regarding the Kawanishi 96 and the Nakajima 98 will be published for M.A.N. readers and SKY SCOUTS the moment it becomes available.)

VICTORY

Flash News

(Continued from page 2)

are 1,400 manufacturers making these parts in a total of 1,500 factories.

A sub-assembly department of North American Aircract now employs 12 deaf mutes whose extraordinary skill working with small parts has won them acclaim in the local efficiency of production contest. The foreman of the department attended classes in "sign" language and now gives vocal orders to his department, then repeats them in sign language to the deaf mutes.

DETROIT FACTS: The Detroit automotive industry now has seven companies producing aircraft engines, nine companies in production on fuselage subassemblies, wings, nacelles, center sections, tail surfaces, etc., and four companies producing propellers. Five companies are producing complete airplanes. Official estimates are that there are now 1,000,000 workers in Detroit defense plants.

Pan-American-Grace Airways have opened a weekly cargo service to Balboa, Canal Zone and Lima, Peru using converted DC-2 transports for the flights. On preliminary flights, the Douglas planes averaged 3300 pounds of payload of machinery, tools and strategic materials including spare airplane parts. This is the first all-cargo route approved by the CAB for any U.S. international airline.

Ryan Aeronautical Corporation of San Diego, California is now engaged in construction of an undisclosed number of Curtiss S03C-1 scout planes convertible for either land operation or single-float water operation. Known as the SOR-1, the ship will go into service with the Scouting Squadrons of the Fleet aboard

See Page 5

cruisers and battleships from which they are launched by catapult. The plane is powered by a single Ranger 12-cylinder engine.

Cessna has recently had approved its latest Army model, the C-78 Personnel Transport. The twin-engine, low-wing monoplane seats five persons and is largely of welded steel tubing and fabric-covered plywood construction.

TWA's Kansas City base has recently been designated a modification center by the Army Air Forces. TWA personnel will make final installations of certain items of government equipment on planes thereby relieving the congestion at the aircraft factory fields where often hundreds of airplanes are awaiting delivery pending installation of a minor item.

VICTORY

Modeling Your Future In Aviation

(Continued from page 13)

ment and passengers.

All of these are mounted on the frame at points especially designed to carry the loads involved. Parts or units transmitting stresses are never attached to the middle of a member that is not designed to withstand bending, as in Fig. 74. They are always fastened at a point where three or more members join as shown in Fig. 75. Model builders who do not understand principles of structural design often make the mistake illustrated in Fig. 74 resulting in breakage with the first sudden strain.

The landing gear of most planes is made of steel tubes and incorporates some kind of shock absorbing device to relieve the shock of landing. On low powered ships rubber shock cord is used as in Fig. 77.

Unlike skin-stressed planes, wings of the skeleton frame type are braced with external struts that take most of the flying load and thereby make possible the use of very light wing spars and cloth covering. Though this system of bracing increases drag, minimum weight is assured.

Details of skeleton type construction can be most readily understood by building a scale model of some typical light plane. A Cub liaison plane will serve our purpose well, and when produced in silhouette form complicated fuselage construction and many duplicated operations are avoided without eliminating the experience of assembling a skeleton frame structure

How to Build a Scale "Cub" Model Glider

The frame is made of hardwood, preferably basswood, though white pine is satisfactory but more brittle. If these are not available, wood from an old cigar box will prove excellent. Full scale plans of the glider appear on pages 13 and 14. Study these carefully before starting construction so all details are thoroughly understood.

FUSELAGE: Start by cutting out all parts for the fuselage 1/16" wide from 1/8" thick stock. This thickness can be obtained by sanding down rough oversize 1/8" stock. Parts include the nose block, longerons and the short connecting struts, which can be cut out with a razor blade or very sharp thin knife. Notches for the ends of struts should be cut very carefully and all parts to the exact length indicated. Note that ends of diagonal struts are beveled and not cut at right angles to their sides.

When all parts are completed accurately, place a piece of transparent waxpaper over the full scale assembly view of the fuselage side. Then lay each wood part over its corresponding part in the drawing, holding it in exact position over the drawing with pins, stuck at an agle through the drawing and into the bench, on two sides of the wood part.

As each part is laid into place, join it to the adjacent parts in the assembly with cement and hold it firmly with pins. Be sure to fill all corners with cement to insure a strong joint; hardwood does not absorb cement as easily as balsa so joints may be weak unless this is done.

When all fuselage parts are in place allow the cement to dry for 1/2 hour before removing the pins and lifting the assembly from the waxpaper.

LANDING GEAR: Next cut the landing gear struts to proper length from 1/32" diam. steel wire and bend them exactly to the shape given in the drawing. There are two sets of struts, front and rear. When properly shaped attach the front struts to the rear ones by binding them together with thread and covering the complete joint with cement as shown.

The landing gear is then fastened to the fuselage by pressing the inverted U's at their center, down over the rear extension of the nose block, as in the fuselage side view drawing. When in place bind together the front legs and then the rear ones by three or four loops of thread directly beneath the fuselage's lower edge. Then tie with thread and cover both thread and wire with plenty of cement.

Next the wheels are slipped on the axles, the ends of which are then bent up at right angles to hold the wheels in place. Cement two sheets of paper between struts.

TAIL SURFACES: Cut out the leading and trailing edge spars of the stabilizer and ribs to the exact size shown on the drawing. Leading and trailing edge and ribs are of 1/32" stock. The main spar is 3/32" wide x 1/16" deep.

Be careful when cutting the pieces for the curved tip edges; use straight grain stock. When parts are finished assemble the leading and trailing edge and main spar, cementing the joints carefully. This may be done in the same manner as the fuselage; laying the parts on waxpaper directly over the drawing on your bench.

Do not disturb this frame until thoroughly dry. Then cement the ribs in place to the leading edge spar and trailing edge at the proper points throughout the stabilizer span. The center spar, being thicker than the leading and trailing edges, the ribs should be slightly bowed, so they must be held front and rear by clamps or pins until the joints are dry. Insert the stabilizer through slot in the fuselage and cement it in place to the "bed" block. Then cement in the vertical lock strut at the leading edge.

FIN: The vertical fin is made in similar manner. When completed cement it to the

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upper and rear edges of the fuselage as indicated in the drawing.

WINGS: Make half the wing at a time. Cut out the ribs and mount them on the spars at proper intervals, cementing them in place at right angles to the spars. Then insert leading and trailing edges in the notch of the ribs, covering each joint with cement.

The curved tip edge may then be cemented in place. Do not cement the center rib that butts up against the fuselage in place until the rest of the wing structure is complete and joints dry. This rib must be inserted at a small angle to give proper dihedral. So when both halves are finished support the wing tips so that they are raised 1" above the bench, the inner ends of each wing resting upon the bench and butting closely together. When in this position insert the center ribs, one in each wing half, so they fit together and are exactly vertical.

When located properly cement each rib to the leading edge, trailing edge and spars of its particular wing half. Do not cement the 2 ribs together because each half wing must be separated. When this is finished fasten the wing to the fuselage in the position shown, by cementing the center bevelled rib to the fuselage sides above the cabin as indicated on the drawing. Hold the wings in place tightly with clamps until the joints are dry.

COVERING: Then the wings may be covered, using thin but strong tissue. Cut out a sheet to fit on the underside first, allowing about 1/4" overlap all around. Then fasten the edge of the tissue close to the edge of the fuselage. While drawing the paper toward the tip cement the paper to each rib successively from center to wing tip. Then tack the paper down to the leading and trailing edge with cement, trimming off the surplus paper. Cover the upper side in similar manner; however if there is a fringe of extra paper around the wing, trim this down to 1/8" wide. Then fold it down and cement it smoothly to the edges and under wing side.

STRUTS: Next cut out the struts, cement them together at the proper bevel at their lower ends. A small 1/32" gusset fits over the beveled joint on their upper side. Cut and bend the small 1/64" diam. connecting wire and cement this to the bevelled ends of each strut, as indicated on the drawing.

Then cement the upper ends of the strut to the wing at the proper location and the joining wire to the lower edge of the fuselage behind the rear landing gear struts. Make sure that the strut assembly fits in place properly before cementing and that the wings are not warped: if necessary cut their ends to make them fit. They may be held with pins while the cement is drying.

STABILIZER: This should be covered in the same manner as the wings.

Now the only uncovered surfaces are the 2 fuselage sides. This is covered with fairly heavy paper; white notepaper may be used. It is most easily done by using the pattern on the drawing and outlining the covering and putting all decorations on with ink and color before applying to the fuselage.

When this covering has been carefully drawn and decorated cut it out carefully to the outline shown and then cement it to the fuselage sides. There are 2 sides so one silhouette covering should be made the reverse of the other.

The little plane is now completed except for inserting the nose weight and applying black lines indicating ailerons, elevators and rudders. Wing decorations, as indicated on the drawing, may also be used. This will give your ship a touch of reality.

NOSE WEIGHT: Inserting the nose weight is the final operation. In order to determine the correct weight to insert in the nose slot, support the little ship on 2 fingers at a point underneath the wing 1" from the leading edge. It should hang horizontally to be in proper balance. Insert a small weight temporarily in the nose slot and test for balance. If the tail hangs low, add more weight; if the nose is down, less weight is needed. Through this process determine the exact weight necessary and cement it securely in the nose slot. Do not attempt to fly your model until this is thoroughly dry.

Flying technique is the same as used with other gliders. First glide it carefully and test it for balance. If it dives bend up the trailing edge of the stabilizer slightly. If it stalls or noses up too much bend the trailing edge slightly downward.

Whether gliding or hanging from the ceiling of your room it provides a most realistic appearance.

VICTORY

WHAT WILL COMET DO IN 1943?

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